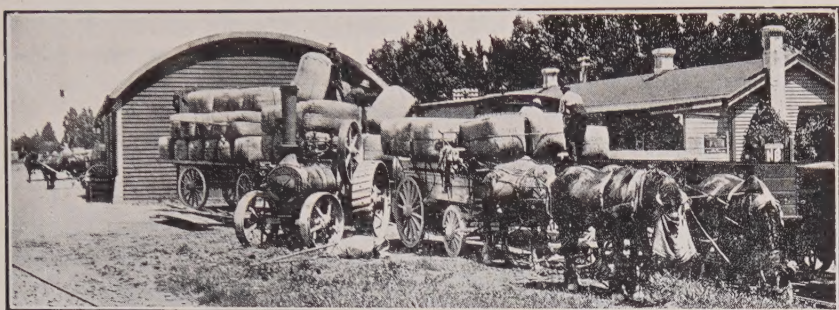




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DRY-ROT OF SWEDES INVESTIGATION.*

PROGRESS FIELD REPORT, SEASON 1919-20.

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A SERIES of experiments has been conducted in Southland during the past season in continuation of the investigation into the disease known as dry-rot of swedes (*Phoma napo-brassicae*). While the experiments are not conclusive as far as control is concerned many interesting facts have been elucidated, which will materially aid in the formulating of further work towards control. Most of the work has been carried out on the experimental areas at Gore and Winton, the actual field-work being under the supervision of the local Fields Instructor, Mr. W. Alexander, whose careful attention, and that of the overseers at each place, tended largely towards the success of the experiments.

The experiments were along lines suggested by results of the previous year's work, and were designed to furnish information on the following phases of swede-production: (1) Production of a long-growing and slowly maturing bulb; (2) production of a large number of small, closely growing, hardy bulbs; (3) study of effect of seed-sterilization

* For the previous season's report see *Journal*, October, 1919.

and spraying of crop ; (4) study of crop-development following different times of sowing ; (5) effect of using seed raised in different localities or of varying origin ; (6) study of closely allied species of plants that might act as host plants for the disease ; (7) variety trials and studies in relative immunity ; (8) disease-resistant selection trials.

(1.) *Production of a long-growing and slowly maturing Bulb.*—It has been before stated in the course of the investigation that a large, rapidly maturing bulb is more susceptible to attack of the disease. The object of the experiments under this head was to produce a large bulb, the growing-period to be as long as possible. This would result in a firm-tissued bulb, and for a long period a large production of leaf. This large leaf-production seems to be an important factor in control. Whether the leaf covering acts purely as a shield against the wind-borne spores, or whether the more shady conditions set up are detrimental to spore-development, remains to be proved.

This phase was divided up into four sets of experiments : (1) Highly nutritive, long-acting manure—stable manure and stack-bottom, 20 tons per acre ; (2) straight-out slow-acting manures ; (3) quick-acting manures plus slow-acting ones ; (4) top-dressing of manures at various periods of growth of crop.

The stable manure and stack-bottom approached nearest the object aimed at. Both plots produced excellent crops of bulbs with a large amount of leaf-production. When finally examined 65 per cent. of the bulbs were affected with dry-rot—20 per cent. primary infection and 45 per cent. secondary infection.

There was no appreciable difference in the growing-period of the other manurial trials, with the exception of superphosphate, which produced noticeably a faster-growing crop. The occurrence of the disease was widespread throughout, certain plots being diseased to the extent of 90 per cent. Owing to the disease making its appearance more or less in patches throughout the trials, reliable detailed comparative analysis of infection was impossible.

(2.) *Production of a large Number of small, closely growing, hardy Bulbs.*—The trial consisted in rates of seeding and thinning, no thinning being carried out in certain cases. Others were thinned to 4 in., 8 in., and 15 in. respectively. Unfortunately, owing to a misunderstanding, the unthinned crops were not kept cultivated with the rest, and the yield was small. In the unthinned crops, on final examination, 14 per cent. of the bulbs were diseased, and in the neighbouring plot thinned in the ordinary way 40 per cent. were affected. (See Figs. 1 and 2.)

This method of not thinning, or thinning lightly, coupled with heavy manuring and intercultivation, is worthy of further trial on a field basis, so that the question of yield in comparison with thinned crops may be determined. The advocacy of this field method may seem to the Southland farmer a retrograde step in that fine art of swede-production acquired and practised by him. He must bear in mind, however, that although thinning is departed from, the practice of intercultivation, the undoubted keynote of success in swede-production, coupled with manuring, must on no condition be relaxed.

(3.) *Seed-sterilization and Spraying*.—The question of the liability of the disease to be introduced into a crop through the spores of the disease being inborne on or through medium of the seed is important of determination. Sterilization of seed by immersion in formalin and by the hot-water treatment was carried out, but these plots happened to fall on an area particularly free from dry-rot, so comparative analysis could not be made. Very little primary infection took place.



FIG. 1. UNTHINNED ROW OF SWEDES, SHOWING THE PRODUCTION OF CLOSELY GROWING, SLOW-MATURING, DISEASE-RESISTANT BULBS.

Tops removed to show the healthy condition of the bulbs. Photo. taken 1/8/20.



FIG. 2. SAME ROW AS IN FIG. 1, BEFORE REMOVAL OF TOPS.
Showing the good foliage cover secured in unthinned crops.

The spraying test, using 6-4-40 bordeaux mixture, was divided up into several trials, and where constant spraying was done (every fortnight after the disease first made its appearance) very little disease appeared. Ten per cent. of the bulbs were affected when spraying commenced, and subsequent infections amounted to only 2 per cent.

A good crop was produced, but the skins became very rough. In the adjoining plot, unsprayed, 36 per cent. were found affected at the final examination. One plot was sprayed as soon as the plants recovered from thinning, and once monthly thereafter. Infection in this plot amounted to 23 per cent.—11 per cent. primary and 12 per cent. secondary.

A rather interesting feature was brought out in the spraying trials. In order to facilitate spraying in one plot all the leaves were removed from the bulbs when the latter were between 3 in. and 4 in. diameter. This plot made practically no further growth. The leaves also were removed from certain rows in the stable-manure plot to see if leaf cover influenced secondary infection. The yield of bulb was considerably reduced by the removal of the leaves, which seems to demonstrate the value to the crop of promoting a long leaf-growing period quite apart from questions of dry-rot control.

(4.) *Times-of-sowing Trials*.—Weekly sowings were made from 30th October to December, and thereafter fortnightly until the middle of January. Among the earlier crops there was no appreciable diminution of dry-rot in any one sowing—that is, wherever a normal crop was produced dry-rot was prevalent. The value of this series lay more in being able to examine at one time a large number of bulbs in respective stages of development.

(5.) *Origin-of-seed Trials*.—Previous work had given slight indications that the origin of the seed sown influenced to a small extent relative dry-rot attack. Certain varieties of swedes were sown from the leading British seed-growing firms, but owing to the disease appearing in patches throughout the series comparative analytical work on degrees of infection was not carried out. Inquiries from Great Britain go to show that the main seed-growing district, East Anglia, is comparatively free of dry-rot, although in the south of Scotland it is fairly prevalent. The question of dry-rot dissemination by the seed is most important to determine.

(6.) *Host-plant Trial*.—The possibility of the disease wintering over on some plant other than swedes was taken into consideration in this series. On land previously in swedes which had been badly dry-rotted the following plants were sown: Rape, cabbage, broccoli, kohlrabi, thousand-headed kale, chou moellier, mangold, and silver-beet. No trace of the disease could be found on any of these plants, although club-root was bad in several.

(7.) *Variety Trials*.—A large number of varieties of swedes were tried, but no one variety, comparatively speaking, stands out conspicuously as being disease-resistant. The bronze-top type, however, when attacked do not seem so suitable a host as do the purple-top type, the disease seeming to work more slowly than in the case of Superlative or Monarch. Superlative perhaps takes the disease more readily than any other variety, and seems a very suitable host for the fungus to develop in rapidly.

(8.) *Disease-resistant Selection Trials*.—In August a selection was made from the twice-swede-land area, and nine large sound bulbs were picked out and transplanted for seed-production. Control along the lines of disease-resistance should be assiduously pursued.



FIG. 3. SEEDLING-STAGE INFECTION.

Showing top withering away through infection of bulb at crown.



FIG. 4. SEEDLING-STAGE INFECTION.

Showing typical crown attack.

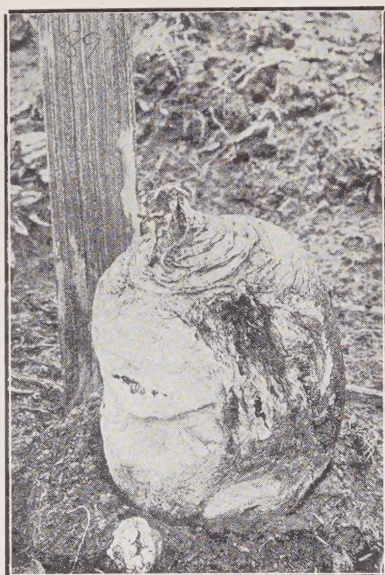


FIG. 5. PRIMARY INFECTION OF WELL-DEVELOPED BULB.

Infection has spread from the seedling-stage-infected bulb in foreground.

DRY-ROT ATTACK AND SPREAD.

There are, comparatively speaking, three relatively distinct stages in the attack on the crop. These stages are not separated by definite lines of cleavage, but each more or less merges into the other. In order to facilitate reference these three stages are here called—(1) Seedling-stage infection; (2) primary or main infection; (3) secondary infection.

(1.) *Seedling-stage Infection*.—Just how early loss occurs in the seedling stage has not yet been determined, but the first-noted effect of the disease is when the root commences to thicken out, approximately six to eight weeks after sowing. The occurrence of this seedling-stage infection, in every case noted, is around the crown. The leaves soon fall back, and the disease works its way right round the neck, resulting at an early age in the death of the seedling bulb (Figs. 3 and 4). No case of recovery or of continued growth was noticed. It is this seedling-stage infection which influences one to the belief that the disease is inborne on the seed sown. At Winton, where there was hardly any disease present in the mature crop, two bulbs were found affected in the seedling stage. Both of these, however, were removed for microscopical examination.

The relationship of seedling-stage infection to subsequent spread is most important to determine. A certain amount of work was done in noting the spread of the disease from these infection centres, and wherever they were in contact with a neighbouring bulb that bulb rapidly went off with the disease (Fig. 5).

On 1st March certain rows were carefully examined, and each affected bulb was labelled as to the exact stage of the infection. The accompanying photographs show such a row, and give some indication of the spread from the early-infected bulbs. Fig. 6 is a general view of row. Fig. 7 gives a close view of the second label from front, where the spread was from the small bulb on the right. The bulb on the left was perfectly whole on 1st March. Infection, however, must have taken place very early after this date.

The spread of the disease, from whatever source, seems to be determined very largely by soil and climatic conditions. Wet low-lying areas, when the disease once manifested itself, were subject to rapid spread. Even very small depressions of soil-level became the seat of bad infection (Fig. 8). Again, where the conditions were drier, even on the same area, and where there was seedling-stage infection, practically no further spread took place. Fig. 9 shows seedling-stage infection where conditions of soil, coupled with a hardier-natured bulb, retarded spread. Adequate drainage, deep cultivation, and liming are important factors towards retarding the development of primary infection.

(2.) *Primary or Main Infection*.—Whereas the seedling-stage infection results in the rapid death of the plant, primary or main infection comes on at a period when the bulb is advanced sufficiently that even when attacked normal growth still takes place, and the bulb is often able to attain to a large size before it is finally overcome by the disease. Others, again, if the attack is later and not too severe, may be able to keep going in spite of the dry-rot. Whether the bulb is finally killed outright or whether it manages to survive, primary



FIG. 6. SHOWING ROW MARKED ON 1ST MARCH TO NOTE SPREAD OF DISEASE FROM EARLY-INFECTED BULBS.

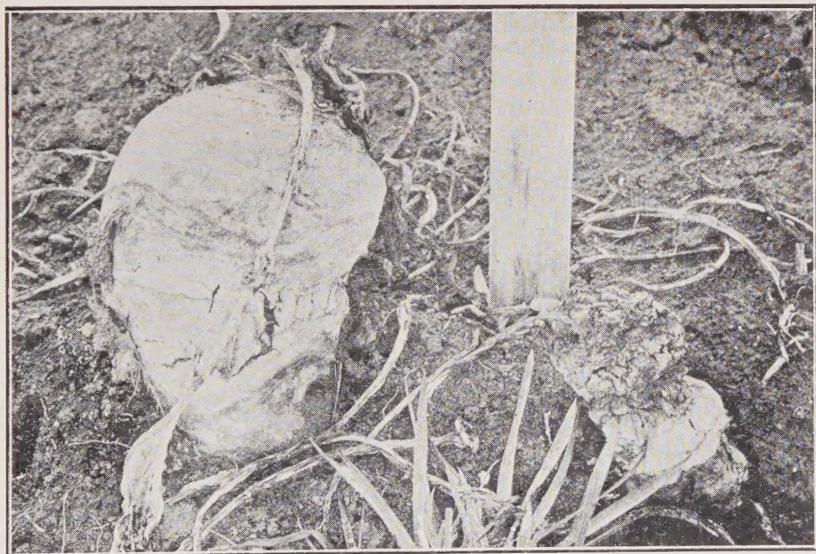


FIG. 7. SPREAD OF DISEASE FROM EARLY-INFECTED BULB.

Bulb on right was diseased on 1st March, when bulb on left was perfectly sound. On 1st August bulb on left was badly diseased through infection from the early-infected one.

infection causes large cracks or lesions to form at the centre of its attack. Generally speaking, neck-infection is the more common.

It is from this primary or main infection that the greatest apparent loss in the crops results. The infection period for this phase roughly extends from the middle of February to the end of April, and, generally speaking, bulbs attacked during this period rot away entirely by the end of August, when the damage becomes most apparent. Primary infection after the end of March is more likely to result in the partial rotting of the bulb.

Primary infection in the main is well above ground. It would certainly appear to be wind-borne spore infection, and the question naturally arises, from whence are these spores blown? The rapid death in the case of attack in the seedling stage would indicate that the primary infection was not caused as the young plant came through the ground, else it would have been killed out as in the seedling stage. The relationship of the seedling-stage infection and that of the later primary infection needs correlation. It would appear that the spores causing primary infections either are blown from the seedling-stage-infected bulbs or are blown up from the soil itself.

A good deal of evidence has been collected lending weight to the theory that the spore winters over in the ground. Crops grown on diseased ground two years in succession are more badly infected than on clean ground. At Gore on 1st March on twice-swede land 11 per cent. of the bulbs were affected, and on new swede land only $1\frac{1}{2}$ per cent. were infected. Again, the infection of certain fair-sized bulbs at ground-level (Fig. 10) indicates clearly infection from the soil.

The development of the disease must be correlated with free access to light and air, for it is very seldom that attack takes place below the surface of the soil, and when a bulb is affected below the soil-level the disease area never assumes any size. A close relationship of spore-development to conditions of air, light, temperature, and moisture exists, but each one of these factors is, in the field, quite beyond our control. The fact, however, that the soil organism does not develop when at any depth limits our attack to the destruction of the spore on or near the surface. How long the organism will remain viable deep down in the soil has yet to be demonstrated.

Primary infection, when the attack is severe, in the main is more common in patches than in isolated individual bulbs, and these patches occur over an area, generally speaking, in soil depressions where the physical state of the soil generally is not conducive to a healthy bulb. Where a bulb is deformed by club-root dry-rot is often more severe on that bulb. The constitution of the growing bulb is an important consideration. The small, hardy, healthy bulb is resistant; the small weakly bulb is more subject to the disease. The development of the patches, therefore, may be either (1) natural spread of the disease from a common centre, or (2) spread of the disease in virtue of those bulbs being in the first place weakly constituted through growing in soil of a poor physical condition.

(3.) *Secondary Infection.*—Whereas primary infection occurs in the main in patches, secondary infection, where the primary patches are numerous, takes place over the whole neighbouring area. This infection is distinguished from the primary in that (1) no large cracks or

lesions occur on the affected areas (Fig. 11) ; (2) the infection works but slowly into the bulb ; (3) numerous small diseased areas result instead of one or two large areas ; (4) total loss of the bulb seldom results. The infection is no doubt due to wind-borne spores blown from the neighbouring primary infected bulbs.



FIG. 8. SHOWING DEVELOPMENT OF THE DISEASE IN PATCHES, DUE TO VARIATIONS IN SOIL-LEVEL.

In this instance the land was cropped twice in succession with swedes, but even so the higher ground was most free from the disease.

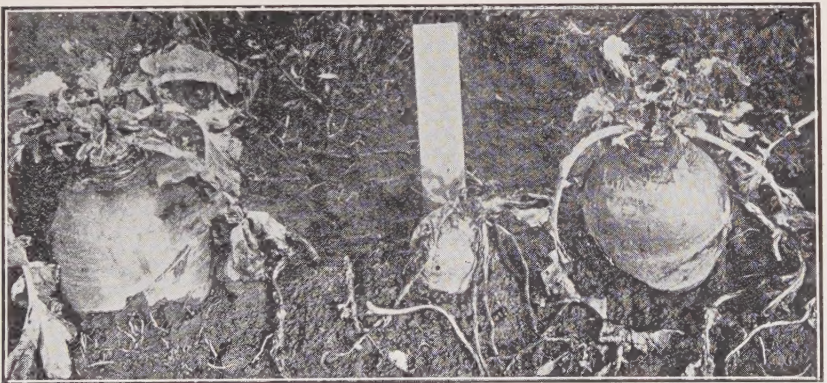


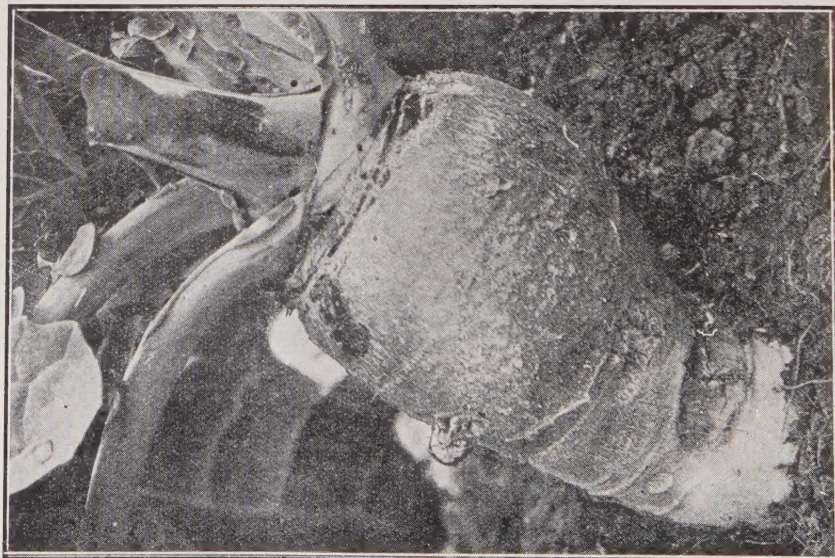
FIG. 9. SHOWING THE NON-SPREAD OF THE DISEASE FROM AN EARLY-INFECTED BULB (IN MIDDLE), WHERE THE GROUND WAS DRY AND IN GOOD PHYSICAL CONDITION.

The enormous amount of secondary infection as compared with primary infection, and its distribution over all portions of the bulb as against the more common neck attack of the primary infection, would indicate that a very great increase in the number of spores in



FIG. 10 [LEFT]. BULB SHOWING PRIMARY INFECTION AT GROUND-LEVEL.
Indicative that the dry-rot organism winters over in the soil.

FIG. 11 [RIGHT]. BULB SHOWING PRIMARY INFECTION JUST BELOW NECK,
WITH CHARACTERISTIC CRACKING OF THE LESION AND NUMEROUS SUB-
SEQUENT SECONDARY INFECTIONS.



the air had taken place, and this no doubt is due to the relatively larger number of primary-infected bulbs present in the crop in comparison with the comparatively few seedling-stage-infected bulbs. The secondary is without doubt the sequel to the primary, and it would appear that the relationship which existed between the primary and the seedling-stage infection was co-ordinate with that existing between the secondary and the primary, the more common neck attack of the latter being accounted for by the fact that when primary infection took place the side of the bulb was protected largely by the leaf covering, the neck becoming the seat of attack in virtue of the spore being washed from the leaves down into the leaf-axil, where it germinated and established, the infection becoming noticeable at leaf-fall.

Secondary infection takes place from April to such time as the crop is utilized, and the degree of infection may be to some extent gauged from the following data: In one plot all primary-infected bulbs were pulled out at the beginning of March, and each succeeding fortnight newly affected bulbs were removed. The number of bulbs so removed each fortnight, commencing 1st April, were 31, 38, 48, 12, 8, 10, 13, 12, respectively, leaving on 1st August 77 bulbs. These figures would indicate that the secondary infection was most severe from 1st April to middle of May. The removal of diseased bulbs, however, no doubt influenced later secondary infections.

FUTURE LINES OF WORK.

The investigation will be continued during the present season, and will be confined mainly to dealing with the organism as it occurs in the soil, and in following up certain of those practices which show promise of success. A survey of a portion of last year's crop has been made, and this area is again being sown under soil-sterilization tests. The subsequent development of the disease on the control (untreated) plots will be correlated with the more or less patchy infection indicated by the survey.

[Photographs by E. Bruce Levy.]

Championship Shows.—At the last meeting of the Board of Agriculture the question of organizing a "Royal" championship show to be held alternately in the North and South Islands, so that visitors in search of stud stock would be able to see the best of the breeds in New Zealand, was considered. It was decided to endorse the recommendation, and a subcommittee was set up to formulate the best method of giving effect to the proposal, and to draw up prize lists for the champion classes. The matter had been referred to the Board by the Council of Agriculture.

Trees for Farmers and Local Bodies.—The total number of trees disposed of to farmers and local bodies by the Forestry Department's nurseries in 1919-20 was 277,235, a large decrease compared with the previous twelve months. The decrease was mainly due to the restrictions imposed by the Railway Department on the carriage of goods, and to a shortage of plants resulting from a bad season in the South.

WOOL-HANDLING AT SHEARING-TIME.

PREPARING THE CLIP FOR SALE.

J. G. COOK, Wool Instructor, Live-stock Division.

THE WOOL-SHED.

THE wool-shed should be thoroughly cleaned out a day or two before shearing commences—not merely swept by a broom, but washed out with water and a little disinfectant. Particular attention should be paid to the parts of the shed which the wool actually comes into contact with. On no account must twine, chaff, or rubbish of any kind be left in the wool-bins, wool-press, wool-room, or on the shearing-board; unless removed such substances are likely to get into the wool and depreciate its value when offered for sale. Sheep-skins should also be kept out of the shed during the shearing-period.

It is essential that there should be a good number of windows in the wool-shed, so as to admit plenty of light. This applies very strongly to the wool-tables, as it is of urgent necessity that there should be ample light at this part of the shed to enable those who are skirting, lapping, rolling, and classing the wool to do their work comfortably, expeditiously, and without error. In a large number of wool-sheds the light is very poor. Windows by the wool-table should be just about the length of the table.

TABLES AND BINS.

A suitable size of wool-table is 8 ft. 6 in. long and 3 ft. 9 in. to 4 ft. wide. It will be found very convenient to have the table canted—that is, one side higher than the other—and the higher side against the wall of the shed. The lower side is where the wool-roller is working from, and when he has done the work on the side of the fleece nearest him he simply reaches across the table and brings the far side of the fleece over to him. Having the table at an angle makes this easier than if the table was level. One often finds the tables made too small, with the result that the fleeces cannot be thrown out straight, which makes good work at the table very difficult, some of the skirtings being apt to be left on the fleece. When the table is a good length and width this greatly facilitates the work of dealing with the wool.

It is very handy to have a small table for putting the locks over. A size of 3 ft. 6 in. each way will do. Put $\frac{1}{2}$ -in.-mesh wire netting over the top of the frame, then nail a board on each side and allow the top edge of the boards to come 4 in. above the netting-wire. When the locks are placed on the table and shaken the rubbish falls through the netting, and dags and large pieces of wool can be readily picked out and each lot put in its place.

A very convenient size for the wool-bins (fleece and pieces) is 3 ft. wide, 4 ft. 6 in. deep, and 6 ft. high, which will hold about one and a quarter bales of wool. The width will allow three large fleeces in each row, or when the fleeces are smaller four will go in each row nicely for handling when pressing. Pieces or belly-wool can be thrown in and tramped occasionally, but each class must be kept in separate bins.

THE FLEECE-PICKER'S DUTIES.

After having shorn the belly-wool off the sheep the shearer should detach it from the fleece and throw it back on the shearing-board convenient for the fleece-picker to pick it up and examine it. If off male sheep the centre will be found stained with urine, and this part must be taken out at once by hand and put into a basket or sack. It is convenient for this purpose to have a sack hung in the corner of the catching-pen with the mouth of the sack open. These stained pieces must be dried outside in the open air before being pressed. After detaching the stained piece from the belly-wool the latter should be thrown into a bin allotted for that class.

When the shearer has finished shearing the sheep and let it go it will be found in nearly every case that the length of the fleece is lying across the shearing-board, the neck part being nearest the catching-pen wall and the hind quarters nearest the counting-out pen door. The fleece-picker will with his feet push the neck towards the britch of the fleece until he is in a convenient position, when, bending down and reaching forward at the same time, with his hands he catches hold of a hind quarter in each hand; then by making a half-circular movement with his hands away from each other he gathers the rest of the fleece between his hands, picking the fleece up and carrying it to the wool-table. Arriving there he turns the back of his hands upwards, and, making a throwing-forward movement, he releases the part of the fleece which he has between his hands, but retains hold of the part which he has in each hand. In this manner the fleece is thrown nice and straight on the table for the wool-rollers.

The fleece-picker will then return up the board and sweep the part of the floor from whence he removed the fleece, as there are always a few trimmings and second cuts to be removed before the shearer brings out another sheep from the catching-pen. In sheds where there is a large number of shearers the fleece-picker will find it convenient to pick the fleece up in the manner just described, put it down against the catching-pen wall, get hold of the broom, and sweep the stand clean. Having done this, he can then carry the fleece to the wool-table. The fleece-picker should see that his board is kept clean, taking all large pieces of wool or dags out of the sweepings and putting each class into the place allotted for it.

The fleece-picker will also put Stockholm tar or sulphur (whichever is provided for the purpose by the owner of the shed) on any cut on the sheep when the shearer calls for it. On no account is coal-tar to be used, as it goes hard, and will not scour out when the wool is being scoured; it also damages the machines in the woollen-mills if it has not been taken out beforehand.

Black fleeces should not be thrown upon the wool-table. Before the shearer brings a black sheep upon the board his stand must be swept clean of all white wool and the black wool kept separate. As soon as the sheep is shorn the fleece-picker should pick the fleece up, put it on the wool-room floor, rolled up with all the locks and belly-wool, where it will not come in contact with the white wool.

SKIRTING, LAPPING, AND ROLLING.

As soon as the fleece is thrown out on the table it is ready to be skirted. This is the critical stage of its preparation for market when

sold in the grease, and it is astounding how many wool-producers neglect to give the fleece the care and attention required—by skirting it properly and classing it. Some engage anybody to do this work, and seemingly are quite satisfied as long as the table is kept clear and the wool got out of their sight into a bale. A very large sum of money is lost to wool-growers every year by bad skirting alone, to say nothing of faulty classing.

Skirting consists in removing by hand from the fleece any outer edges which do not harmonize with the rest of the fleece. The following method is recommended: Starting at the britch, remove any part which is stained either by excreta or urine, going right across this part of the fleece. Having detached these pieces, throw them into a basket, which should be handy to the table for that purpose. Then work along the side of the fleece nearest to you, removing any dirty pieces with the one hand, and as you skirt this side turn the fleece in one-third its own width with the other hand. Now you come up to the armpit of the fleece, and this part should be watched carefully, as it is just here that the skirtings are the dirtiest, this being partly due to the action of the fore leg, and to the sheep when lying down always having this part in direct contact with the earth. Another cause is the action of the heart generating increased heat and perspiration in that part of the body. Now pass along up to the neck and cheek pieces, which must be removed. As a rule one finds that this wool is inclined to be a bit knobby or clubby at the tip, and it should be kept separate from the skirtings along the sides of the fleece. Now turn the neck part of the fleece back slightly towards the shoulders, and look back on the side you have skirted and turned in. The shorn side being up, you can see if any skirtings have been missed; if so, remove them at once. Then reach across the table with both hands, catch hold of the far side of the fleece, and bring the full side towards you until that edge rests flush with the side nearest you. This way of bringing it over brings the shorn side uppermost. Now go down the last side of the fleece, removing any dirty skirtings; with the shorn side turned up you can see at a glance what to take off. Working back from the neck of the fleece to the britch, throw the skirtings into the bin allotted for them, and the fleece, being properly skirted and lapped, is now ready for rolling. Turn the britch in and roll right from it straight out to the other end of the fleece. Fleeces done up in this way do not need tying of any description. This is the simplest, easiest, and quickest way of skirting, lapping, and rolling; the operator can always see over his work and rectify any errors when skirting, and the fleeces are readily handled afterwards. Do not adopt the practice of rolling the fleece from both ends. Such fleeces when being handled come loose, both ends bulge out, and rolling again is necessitated. Besides, there is always a loss of time when rolling at the table.

Carrying out the practice described, the following lines, which have been removed from the fleece wool, will result: (1) A pieces—the skirtings taken off on each side of the fleece; (2) neck-pieces; (3) stained pieces—wool stained either by excreta or urine; (4) belly-wool; (5) locks—the sweepings of the board and small pieces which fall under the wool-table.

CLASSING.

The classing of the clip should have the careful attention of the wool-grower. Wool-clips vary in every district, but the following notes will be found useful for classing.

"Combing" is a term applied to any wool which is strong and long enough to go through the combing-machine in the woollen-mills. "Clothing" is a term applied to any wool which has a break in the fibre, or wool which is too short for the combing-machine.

A or first combing: This grade comprises the finest, brightest, and cleanest combing-fleeces in the clip. The line should be made broad enough to take in the greater part of the combing-wool.

B or second combing: This takes in the coarser combing-fleeces, heavier in condition and duller-looking than the first combing.

C combing: This grade applies to a merino clip in which are found a number of fleeces of very fine wool, but having that heavy greasy tip on it. This wool is best kept by itself, as when scoured properly it will realize the same money as the A combing does when scoured, but owing to the big percentage of loss in scouring the buyer will not give so much for it in the grease as he does for the A combing.

Clothing: Fleeces which are clean, but either too short or too tender for combing purposes.

Dingy: This term covers any fleeces which have been discoloured either by climatic conditions, log-stain, or parasitic pests.

Sandy: This term covers any fleeces which have sand right throughout them. As the sand absorbs the yolk instead of the wool doing so, this wool is always found to be tender, and requires a lot of soap when being scoured. It is mostly found on sheep running on very high country.

Cotted or matted: These fleeces should be put in a bin by themselves. The cottiness is caused by the oil-glands failing in their duty.

Seedy: On no consideration should seedy wool be packed with clean wool. All lots must be kept separate if full value is to be received for clean lines. "Seedy fleece," "Seedy pieces," "Seedy belly-wool," "Seedy locks," "Seedy stained pieces," respectively, is the best way to mark each line which is carrying seed. Enter it thus in the wool-book; then there is no chance of it being put up for sale with the clean wool and interfering with the prices the latter will realize.

Double fleece: This means any fleeces which have not been shorn for two years or over.

Black fleece: As previously mentioned, this should not be thrown on the table, and must be kept away from the white wool.

PRESSING, WEIGHING, AND BRANDING.

The presser should see that his press is in order, and that the woolpacks before being used are put out in the sun, this making the sewing of the bale easier. When putting fleeces into the bale it will be found that three large fleeces will fit in each row, and that two rows are required to fill the square of the press. This is the best method, as in the first place it gives the presser a firmer surface to tramp down,

and the wool does not spring up as it does when it is just bundled in. Further, the weight is got in easier, and the wool is well shown in layers of six when the bale is opened for sampling.

After pressing comes weighing, branding, and entering the description of the wool in the bale in the wool-book. The bale should be branded on the cap end with the station or farm name and the number ; then the same done on one side, also branding on the class of wool in the bale. Say it is A combing, Romney Marsh hogget : the letters A over RM over H will do ; or if it is wethers W will suffice. If scales are available it is best to have the bale weighed.

All bales as soon as they are branded and weighed should be duly entered in the wool-book, with number of bale in left-hand column, description of wool in the bale in the wide column, and the weight in the three columns on the right. When sending the wool to market an invoice copied from the wool-book should be sent to the selling firm.

SHEEP-MANAGEMENT NOTES.

III. SHEARING PRECAUTIONS, AND BRANDING.

F. MACKENZIE, Inspector of Stock, Christchurch.

THE annual loss of sheep from blood-poisoning at shearing-time is yearly increasing, and preventive measures should have the serious attention of sheep-farmers. Unfortunately, a number of owners still persist in making use of the shearing-shed as a storehouse for all sorts of material—from dead skins to old and dirty sacks ; and as most shearing-sheds stand on piles, sometimes 3 ft. or 4 ft. high, the space underneath the shed is often utilized for all manner of purposes. The writer recently visited a property where the fowls were actually netted in under a portion of the shed, and a few yards farther away it served as a dog-kennel. It is therefore little wonder that heavy losses occur from infection at shearing.

The first consideration is absolute cleanliness of the shearing-board and counting-out pens. The floor and walls of the shearing-board should be thoroughly scrubbed with a disinfectant before and immediately after shearing. The counting-out pens should be swept clean and liberally sprayed with disinfectant and afterwards a small quantity of unslaked lime spread on the pens.

The shearers' water-pots for cooling shears or machines are a likely source of infection. They should be cleansed with disinfectant, and when refilled with water a small quantity of kerosene should be added. The reason for this is that the kerosene floats on the surface, so that every time the shears are withdrawn a coating of kerosene adheres to the shears and acts as a very good disinfectant. Some years ago I investigated a mortality from blood-poisoning on a large back-country station, and the trouble was undoubtedly traced to the shearers' water-pots, for after treatment as described the mortality immediately stopped.

By far the most common cause of blood-poisoning is the entrance of germs through small wounds—wounds which are very often unnoticed by the shearer. As soon as these small wounds are covered over with scurf or matted wool the germs of blood-poisoning immediately become active. A sharp lookout should be kept, and no matter how small the wound each should be dressed with Stockholm or Archangel tar, which should be kept handy in a receptacle for the purpose. All excreta are hotbeds of bacteria, especially from such animals as pigs, fowls, or dogs, and the quartering of such animals in or near a shearing-shed should be carefully avoided. The excreta when dry are blown about by wind, and often deposited in the counting-out pens and even on to the shearing-board, or on to the fresh wounds while the sheep are held for counting and branding.

Branding.—Immediately after shearing all sheep should be carefully branded with the registered brand of the owner—that is, in all districts that are not exempt from wool-branding. Unfortunately, a number of owners brand in a very careless manner; the oil or paint used is not of the proper consistency and simply makes a blotch. Section 62 of the Stock Act states that all sheep shall be distinctly and legibly branded with the owner's registered brand, and for every such sheep not so branded the owner shall be liable to a fine not exceeding 10s. In the case of stragglers or sheep shorn by mistake, these should be branded on the head with the registered brand of the owners in whose shed the sheep have been shorn, or, if he has no registered wool-brand, with a distinguishing mark of paint or tar. Failure to observe these rules is often the cause of bad feeling between neighbouring owners, and sometimes ends in Court proceedings. All lambs should be branded not later than 30th April in each year.

TESTING OF NEW-ZEALAND-GROWN WHEATS.

B. C. ASTON, F.I.C., F.N.Z.Inst., Chemist to the Department.

THE testing of New Zealand wheats by practical milling tests was commenced, in 1909, by this Department sending a number of samples to the Chemist of the Queensland Department of Agriculture, Mr. J. C. Brünnich, F.I.C., who reported on the quality of the wheats after putting the samples (which were selected in New Zealand by Messrs. G. Baylis and A. Macpherson) through an experimental mill. Mr. Brünnich's report (9/7/09) stated that all the wheats were excellent samples of grain, but (with the exception of the harder wheat Comeback) gave flours rather low in gluten and strength. The total points, judged by the following criteria—namely, appearance of grain, weight per bushel, ease of milling, percentage of flour, colour, gluten, and strength—ranged from 76 to 88 per cent. in the eight samples forwarded. Mr. Brünnich's test of Yandilla King (Australian-grown) was 84 points. In 1911 thirty samples from the South and North Islands were similarly kindly tested by Mr. Brünnich for the Department. These showed a range of from 77.5 to 85 per cent. of points. The results were printed in the *Journal* of June, 1910 (p. 21), and of May, 1912 (p. 410). The first-mentioned article also gave Mr. Macpherson's views

as to the millers' attitude regarding the introduction of new varieties of milling-wheats, with special reference to the Solid-straw Tuscan variety. In the May, 1912, *Journal* the present writer remarked as follows: "While it may not be altogether fair, without knowing more about the origin of the samples, to compare these wheats with those Queensland wheats tested by Mr. Brünnich in 1909, it may be stated that of forty-eight samples the average of points gained was 83.3 in 100; in 1910, of fifty samples the average was 83.8; whereas these thirty New Zealand samples, it will be seen, give an average of 79.4." In 1914 Mr. Brünnich was again approached to carry out some tests, but he was unable to comply.

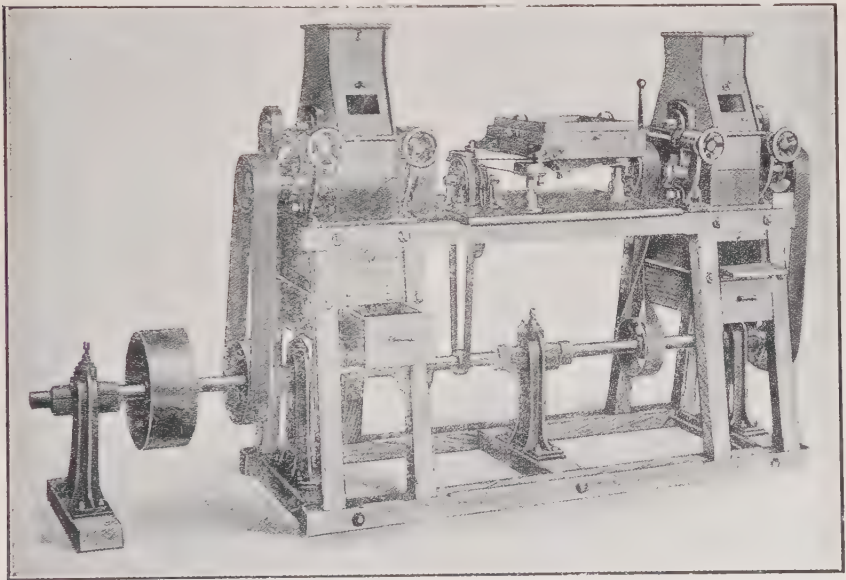
It will be noticed on referring to the records in question that none of these samples came from districts which are fairly similar in climate to Australia—namely, Central Otago and Marlborough. The results show some striking differences in the tests of the New Zealand wheats grown in climates similar to each other. What, then, may one expect of the results of those grown in dissimilar climates, such as the arid areas mentioned compared with, say, Timaru or Marton? A correspondent who has given much attention to the subject writes as follows: "Some contend that the farmer is not receiving under the present grading fair value for wheat grown, and that there is great need of protecting and educating him in regard to best wheats to grow. He can receive this protection and education by the Department of Agriculture having properly equipped means for testing wheat by chemical and baking tests. Under present conditions he has no protection, as the millers can condemn a wheat unjustly and give their own figure. Thus, no matter how good a wheat may be, both from a farmer's and a baker's point of view, the miller can, by giving less for it than for other varieties, so discourage farmers from growing it, or, more bluntly put, make it unprofitable for them to grow the variety. It is stated that a significant fact which proves this to be correct is that for over forty years no new varieties of wheat introduced into New Zealand have succeeded [commercially] owing to the attitude of the millers, and that the millers discourage the growing of any new variety if it yields well, so as to prevent farmers generally growing it on account of being accustomed to the mix necessary of the old variety, most mills not being equipped to deal with all varieties."

Whether these contentions are right or not, there is certainly enough evidence to show the necessity of testing wheat grown in New Zealand by means of milling, chemical, and baking tests. The Department has accordingly purchased and is installing in the Chemical Laboratory a small experimental roller flour-mill of the same type as those used in the laboratories of the Australian State agricultural chemists.

The results of the use of these mills will be found in the reports of the Queensland Department of Agriculture, and in a Bulletin of the Department of New South Wales, No. 7, 1912, where Mr. F. B. Guthrie, F.I.C., goes thoroughly into the value of a testing flour-mill to his Department. Jago, in "The Technology of Bread-making," page 847, "Milling Tests," states: "The only true test under these circumstances is the milling test, in which the various wheats are ground separately and their resultant flours tested chemically and by baking. They should then be mixed in the desired proportions, and again tested until such a blend is obtained as satisfies the miller's desideratum—a maxi-

num of quality at a minimum of cost. With very small milling plants it is the custom to make a trial by putting a few sacks of a newly arrived wheat through the entire mill. But while this is a tedious and expensive experiment with a small plant it is practically an impossibility with a large one. The obvious alternative is to lay down a small milling plant for experimental purposes. This must not be too large, and yet must be large enough to make a fairly good commercial sample of flour."

It is hoped that as soon as the final fittings and adjustments are made to the Department's plant it will be possible to test a large number of typical samples of wheat grown in different parts of New Zealand, with a view to determining the best varieties to grow in each district for the production of flour.



THE ALLIS EXPERIMENTAL REDUCTION MACHINE.

The mill in question is made by the Allis-Chalmers Manufacturing Company, of Milwaukee, U.S.A., and is named the Allis Experimental Reduction Machine. It is fitted with corrugated and smooth rolls, by means of which successive reductions of the grain can be made, and the gyrating sifter is provided with a set of interchangeable sieves for making separations through different numbers of cloth. Owing to the small quantities of material handled continuous operation is not practicable, and the stock is passed by hand from one operation to the next. The model here illustrated has two pairs of rolls, but the machine purchased by the Department has three pairs, the frame being extended for that purpose. To give an idea of the size of the machine it may be stated that its height is 3 ft. to the table, and slightly more than 5 ft. over all. The power required to drive this mill is about 5 horse-power.

SORREL IN TURNIP CROPS ON LIGHT LAND.

CONTROL WITH SHEEP AND LAMBS.

E. B. MILLTON, Birch Hill Station, Rangiora.

It is accepted as an axiom by many who farm the light lands of the Canterbury Plains that it is impracticable to grow two successive crops of turnips upon the same land, for the reason that sorrel takes possession after the first crop. On the stony areas adjacent to the foothills the expense of breaking up land, either from tussock or old pasture, is considerable, and consequently it is often desirable to take a second crop of turnips in order to recoup the cost of the first ploughing. Moreover, the heavy natural manuring accruing from the feeding-off of a second crop, apart from the second drilling of fertilizers, assures the permanency and luxuriance of the grasses sown subsequently.

The writer has made it a practice for some years past to take successive crops of turnips off the same land, and has known no failures. He is satisfied, however, that in the variable and moist climate of the foothills it is useless to place reliance upon teams and implements to eradicate sorrel. The working of sorrel-infested land in the average local weather merely aggravates the evil. A simple control method is available in the use of a draft of weaned lambs. Upon most mixed farms there are sufficient lambs of an age suitable for weaning at the period when turnips are in the rough leaf.

The writer's practice is to keep the land intended for turnips stocked from the time the first crop has been fed off. Shorn sheep best serve the purpose, for the reason that they have no wool to suffer from dust. They should be kept running on the land during ploughing and all subsequent processes of cultivation and drilling, until the first seedling turnips make their appearance. Up to this point the sorrel has had no opportunity of raising its head because the young growth is eagerly sought for by the sheep.

For a short time, varying with the weather-effect upon the growth of the turnip-plant, the sheep must then be removed; but as soon as the foliage has a spread of 2 in. to 3 in. lambs, one to 2 acres or one to the acre, may be turned on to the crop, when they will seek and graze the sorrel, and most other weeds, in preference to the turnips. This reference, be it understood, is to rough-leaved turnips—not swedes. At this stage it is necessary merely to watch the lambs, preferably from day to day, and assure oneself that they are sufficient in number to keep the sorrel down, and, incidentally, to note that the crop is not stocked hard enough to force the lambs, through hunger, to feed on the turnips. It is a safe practice to change the lambs, or give them a run on grass for a day or two, after they have been on the turnips for about a fortnight. It may be noticed that a turnip-plant here and there has been cropped, but that will have been due to inadvertence, and not partiality, on the part of the lamb. When the turnips cover the ground the lambs have played their part and may be removed. If the lambs are not taken off or carefully watched there is a danger of damage to the roots when the latter become as large as a tennis-ball.

The following specific notes upon the practice just detailed are taken from a diary of 1917-18: Area of field, 50 acres. Rainfall—December, 1917, 9.92 in.; January, 1918, 3.14 in.; February, 1918, 4.12 in. Character of land, very stony. Condition, infested with sorrel after turnip crop. Owing to war conditions and wet weather ploughing was done intermittently. Ploughing commenced on 7th November, and was not finished until 17th December. Nine days were occupied in harrowing with giant tripod harrows. Drilling with Imperial Green Globe and 1 cwt. fertilizer per acre commenced on 4th January and ended on 9th January. During these operations a number of dry ewes—sufficient to keep the weeds in check—were running on the land, and were not removed till 14th January, when the seedling turnips were showing freely. On 21st January (only one week later, be it noted) 30 half-bred lambs were turned on to the 50 acres, and the results watched daily. Further references in the diary show that the lambs were put off the field on the 26th and not returned till the 30th, not because the turnips were being grazed, but because the lambs could not be closely watched. From the date last named the lambs remained on the ground until the turnips outgrew the sorrel and the crop was assured. The writer commenced the practice of lightly stocking young turnips in the summer of 1917, and, after assuring himself by personal attention to the test in 1918 that the practice was sound, has continued it with confidence and success.

It is perhaps as well to remark that wet ewes should not be turned on to young, succulent growth of sorrel, because they are apt to become "blown."

NOTE.—The fact that the rainfall in the country adjacent to the Canterbury foothills is much greater than in the lower plains must be given due weight when considering the application of the sorrel-grazing practice here described to drier areas. The article relates particularly to foothills conditions.—EDITOR.

RED POLL CATTLE.

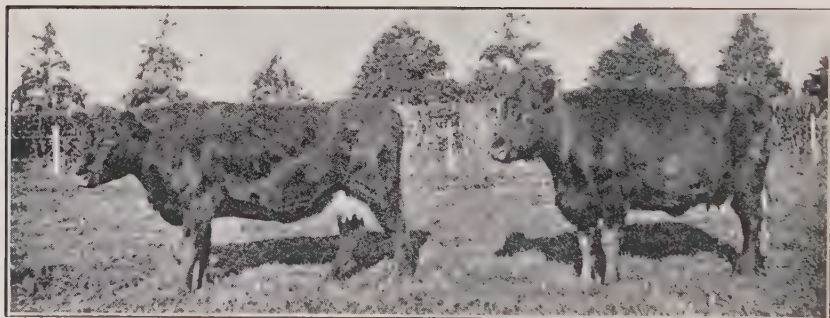
THE WERAROA HERD.

THE appearance of cattle from the Department's Red Poll herd at several North Island shows this spring has caused much interest among farmers on those occasions, the breed being very sparsely represented in the Dominion, especially in the northern division. A few particulars of the herd—maintained at the Central Development Farm, Weraroa—and photos of some of its representative animals are therefore published for further information.

The herd was established in January, 1918, by importation of a selection of animals from the Werribee Experimental Farm Red Poll herd, Victoria, which in its turn was largely founded from direct Old Country strains of this ancient British breed, originally connected with the County of Sussex. The animals received from Werribee consisted of two bulls (Aviator and Force Majeur) and twenty cows and heifers. The aim since then has been to build up the number of the milkers, and fortunately for this purpose the progeny have so far been nearly all heifers. The numbers are now forty-five females and the two stud



GOLD TOP.



TWO FIRST-CALF HEIFERS: MELANESIA AND LUCKY HIT.



SYLPH.

bulls. Several young bulls have been sold at the last two Weraroa sales at good prices, the highest figure being 120 guineas paid for Dominion Air Raid by Sir R. Heaton Rhodes, whose Red Poll herd, at Tai Tapu, is one of the very few existing in New Zealand.

The Department's experience with the breed at Weraroa has been very satisfactory. The animals have well maintained the dual-purpose characteristics claimed for the breed. As showing the milking-capacity of the females it may be mentioned that fourteen out of eighteen cows and heifers averaged 8,256 lb. milk, 4.3 test, and 352.5 lb. butterfat during their lactation period last season. Seven of these were first-calvers. The following are some of the top records: Sylph, 10,998.25 lb. milk, 505.78 lb. butterfat (365 days); Gold Top, 9,492.25 lb. milk, 462.78 lb. butterfat (365 days); Opticia, 9,868.50 lb. milk, 436.66 lb. butterfat (359 days); Neutral (first calf), 9,427.25 lb. milk, 403.83 lb. butterfat (345 days). These records were obtained with twice-a-day milking and no special feeding—according to the practice followed at Weraroa in all record-testing—the animals being treated on a par with the rest of the herd. The results are all the more remarkable in that it has not been feasible so far to cull the herd on milk-yield. It may be added that no udder troubles have been experienced in the herd, and that the mortality has been nil.

The two stud bulls of the herd have exceptionally good milk records behind them. Muria, the dam of Force Majeur, holds a Victorian record of 14,792 lb. milk, and 885 lb. butterfat, in 365 days. Aviator is from the Virginia family, recognized at Werribee as the best-producing line of blood.

As regards beef characteristics, the milking-animals have maintained in general wonderful condition right through. They have shown themselves thrifty and hardy, wintering well and keeping their sleekness in remarkable degree. The weight of these nuggety beasts was shown at the Manawatu Show this month, when one of the Weraroa cows, Superior, registered 1,596 lb. on the weighbridge.

The accompanying pictures give a good representation of females of the Weraroa herd, but it must be noted that the photos of the cows were taken at the end of their milking-period when they had comparatively little udder show.

Basic Slag.—Summer top-dressings of basic slag have given quite good results both in New Zealand and Great Britain. It is advisable, however, to keep stock off the slagged pasture until rain has washed the material off the herbage.

Pinus radiata (insignis) Plantations.—The increased values of our indigenous timber have resulted in the felling and utilization of large quantities of *Pinus radiata* from farmers' plantations and shelter-belts. In many cases these plantation-trees had reached their natural maturity, and, provided new plantations are made, their use for timber was advisable, but it is to be feared that high prices have induced many farmers to fell plantations which should have been retained for shelter purposes.—*Forestry Department Annual Report, 1919-20.*

TESTING OF PUREBRED DAIRY COWS.

C.O.R. LIST FOR OCTOBER.

W. M. SINGLETON, Assistant Director of the Dairy Division.

THE list which follows contains the names of 128 cows and heifers the owners of which have received certificates of record since last publication. Jerseys, Friesians, and Milking Shorthorns are represented. For the latter breed a new class-leader appears, but there are no others, despite the fact that some of the classes contain records of special merit.

JERSEYS.

The honours for the junior two-year-old class in this list go to Meadowvale Silk gown, owned and tested by Messrs. E. O'Sullivan and Sons, who also have three representatives with high records in other classes. Meadowvale Silk gown is sired by Sunflower's Perseus, a C.O.R. bull with two daughters over 500 lb. butterfat, commencing test under two years of age, and one three-year-old daughter in the 600 lb. class. This bull represents the K.C.B. and Monopoly strains, well known as strains figuring in the pedigrees of a number of good C.O.R. Jerseys. The 600 lb. daughter of Sunflower's Perseus is Meadowvale Pegasus, who stands top of the list of three-year-olds in this report. This young cow is from Magnet's Peggy, a double granddaughter of Magnet's Boy. Magnet's Peggy is a C.O.R. cow with a production of 453.85 lb. butterfat in 315 days. The close relationship between Meadowvale Pegasus and Lady Peggy will be noted by interested breeders.

The three-year-old class has in addition to the one 600 lb. record three which have attained to the 500 lb. class. The premier position for these three 500 lb. cows is held by Eaton Ladybird, owned and tested by R. L. Parkin, of Fitzroy, New Plymouth. This young cow represents well-known strains, being sired by Pencarrow's General, a son of Fancy's Carnation Fox from Bridal Flower, who is a daughter of Viper. The dam of Eaton Ladybird is an untested daughter of Molina's General from an untested daughter of Silver King (Gould's).

The four-year-old class has been strengthened by another 600 lb. record, and two others which are over 500 lb. of butterfat. Woodstock's Princess was tested during her first lactation period, when, commencing at the age of 1 year 335 days, she won a credit for 496.48 lb. fat. Evidently this record did not do her justice, as she has been tested during the past season by her owner, Mr. H. J. Burrell, and has now raised her credit by 152.68 lb. at 649.16 lb. for her C.O.R., as here published. She is by K. See XV, from Sybil See, who is a daughter of the same sire. Sybil See's best record was 595.32 lb. butterfat, her test commencing at the age of 5 years 11 days. She is nearing the completion of another season under test, and her record is likely to increase the best previous record to some considerable extent. Evidently the concentration of K.C.B. blood in Woodstock's Princess has tended towards an increased production. K.C.B. has now twenty-three C.O.R. daughters, two of which have repeat records.

The records of Snowlette, tested by H. J. Burrell, and Decision, tested by W. H. Miers, deserve special mention, but lack of space prevents our going into detail.

The mature class is one with which all lovers of purebred dairy cattle have reason to be specially gratified. Of the first dozen cows, four have records in the 600 lb. class, and eight others have credits exceeding 500 lb. One of the 600 lb. cows, Woodstock's Baby, made a strong endeavour for the 700 lb. distinction. She has now been tested on three lactations. Her first test commenced before she was two years of age, and on this she won a record for 514.04 lb. fat. Her second test commenced at the age of 3 years 302 days, and on this she won a credit for 657.91 lb. fat, which gave her the leadership for that class. Her third test, as here listed, is but little short of the 700 lb. mark.

Messrs. Muggeridge Bros. are the owners of Jessica's Maid. She was, however, tested for them by Mr. S. J. Bennett, of Kaupokonui, to whose care and attention her splendid record is no inconsiderable tribute. The sire of Jessica's Maid is Mermaid's Sultan, a son of Campanile's Sultan. Mermaid's Sultan is therefore half-brother to Sultan's Daisy, a cow which we believe holds the world's record for twice-a-day milking, at 968.22 lb. butterfat.

In more ways than one, Peaceful, tested by Messrs. A. and J. O'Donnell, is a close neighbour of Jessica's Maid, and they represent the district near Manaia very worthily indeed. Peaceful is by Rainbow, who is from the same dam as Sultan's Daisy referred to above. The records of Jessica's Maid and Peaceful suggest that Sultan's Daisy inherited factors for butterfat-production to a marked degree from both parents.

We should like to comment on the records of more than a dozen cows in this list, but must have some regard for the Editor's viewpoint, and for this reason refrain from so doing.

FRIESIANS.

Of the records appearing in this list for the juvenile classes the production of Oakwood Betty stands out pre-eminent. An inspection of her pedigree suggests that, given the treatment she received at the hands of Mr. Brash, manager at Bainfield, she could not be expected to do other than place a good record to the credit of her owner, Mr. W. D. Hunt. Oakwood Betty is sired by Oakwood Holland King. His sire is King Segis Wild Rose Homestead (Imp.), who has some seventeen C.O.R. daughters with records ranging up to 706.55 lb. butterfat for a senior three-year-old. The dam of Oakwood Holland King is Dutchland Queen, who has a C.O.R. for 610.09 lb. butterfat. This cow is a daughter of Van Tromp, from Holland Queen, who held for quite a time the leadership of the mature class at 755.78 lb. fat. Van Tromp has eleven C.O.R. daughters, and Kruger II, the sire of Holland Queen, has thirteen. The dam of Oakwood Betty is a 482 lb. butterfat daughter of Rozine's Butter-boy. This bull has three C.O.R. daughters, including Oakwood Clover, who as a four-year-old has a credit for 580.10 lb. fat. Rozine's Butter-boy is a double grandson of Sir de Kol Inka Pietertje, who, like Kruger II, has thirteen C.O.R. daughters to his credit.

This month's list of senior three-year-olds has one record in the 500 lb. butterfat class in that of Bainfield No. 4. This cow was tested as a heifer, when she produced as a senior two-year-old 458·37 lb. fat.

The junior four-year-olds have also a 500 lb. class record. This was made by Viola's Pietertje Gem, owned and tested by J. J. Walker. She is a daughter of Viola, who was tested by James Parkinson, and has a C.O.R. for 661·16 lb. fat.

The highest-production figures in this list and the only 700 lb. record is that of Belle Fayne Segis, owned and tested by Mr. C. Goble, of Piakau, Inglewood. She is a daughter of King Fayne Segis II (Imp.), and from Belle, a daughter of Sir de Kol Inka Pietertje (Imp.) from Belle of Brooklands (Imp.). Belle Fayne Segis therefore traces entirely to North American strains. King Fayne Segis II is from a daughter of Johanna Rue III's Lad, who sired Finderne Pride Johanna Rue, a one-time world's record cow with a credit of 1,176·47 lb. butterfat. As already stated, Sir de Kol Inka Pietertje has to his credit thirteen C.O.R. daughters.

Friesland Wild Rose, a daughter of King Segis Wild Rose Homestead, has produced a good record for the mature class, and in this month's list of Friesians comes second to Belle Fayne Segis. Her dam is a daughter of Kruger II from a Longbeach cow.

The present list adds to the credit of the Friesians one record in the 700 lb. butterfat class, two records in the 600 lb. class, and five in the 500 lb. class.

LIST OF RECORDS COMPLETED IN OCTOBER, 1920.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
JERSEYS.						
<i>Junior Two-year-old.</i>		<i>Yrs. d.ys.</i>	<i>lb.</i>		<i>lb.</i>	<i>lb.</i>
Meadowvale Silkgown	E. O'Sullivan and Sons, Tariki	1 359	240·5	365	8,359·4	527·99
Woodstock's Fanatic	Mrs. A. Banks and Son, Kiwitea	1 305	240·5	365	8,848·5	490·57
Cream K.C. ..	A. L. Hooper, Mahoe	1 297	240·5	365	7,970·7	489·13
Holly Bank Orange Lady	S. J. Bennett, Kaupokonui	2 10	241·5	365	7,901·0	479·68
Lucretia	H. R. Benbow, Ormondville	1 351	240·5	365	7,286·1	449·47
Beauty's Magpie ..	S. J. Bennett, Kaupokonui	2 26	243·1	365	7,992·3	430·40
Orange-girl ..	W. Anderson, Aokautere	2 17	242·2	365	7,298·1	415·81
Una of O.K. ..	V. W. Nowell, Hawera	2 40	244·5	318	6,559·8	393·66
Favorite's Miriam ..	A. J. Edwards, Ohaupo	2 13	241·8	365	7,238·95	380·08
Oline	J. G. Harkness, Wellington	2 1	240·6	365	7,623·6	379·15
Wattlewood ..	F. C. Ross, Kiwitea ..	1 360	240·5	335	7,251·2	373·69
Goldie's Sunbeam ..	G. T. Gibbons, Ngaere	1 364	240·5	339	6,463·8	362·34
Little Ruth ..	G. T. Gibbons, Ngaere	1 354	240·5	328	5,657·6	346·94
Raindrop	J. W. Bradey, Te Horo	1 364	240·5	365	5,821·2	340·74
Glenmore Belle ..	A. C. Lovelock, Woodville	2 9	241·4	291	7,027·2	334·25
Petune's Blossom ..	H. C. Sampson, Hillsborough	1 335	240·5	344	5,380·9	318·96

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
<i>Junior Two-year-old—continued.</i>						
Jersey Brae's Countess	T. Church, Te Rapa ..	1 322	240·5	294	5,121·6	312·47
Springfield Rita ..	C. H. Thompson, Hastings	1 336	240·5	365	4,901·5	311·28
Carlita	Mrs. A. Banks and Son, Kiwitea	1 305	240·5	365	5,020·5	302·74
Orielton Meadow Queen	B. Tripp, Gleniti ..	2 30	243·5	327	6,148·0	302·07
Jerseydale's Elsie's Beauty	T. H. Broomfield, Auroa	2 44	244·9	349	5,269·0	301·54
Armidale Eva ..	P. A. Swney, Waihou	1 345	240·5	285	5,057·34	259·64
Black Bud ..	C. H. Weston, New Plymouth	2 35	244·0	311	6,920·6	254·89
<i>Senior Two-year-old.</i>						
British Maid of O.K.	E. S. Walker, Stratford	2 350	275·5	328	8,137·5	406·76
Cremona	H. Hodge, Alton	2 345	275·0	327	7,580·8	381·54
Flotsam's Hope ..	F. C. Ross, Kiwitea ..	2 295	270·0	327	8,080·5	371·55
Passion's Dream ..	E. S. Walker, Stratford	2 308	270·3	362	6,196·8	367·67
Lady Betty ..	S. Atkinson, Papatoetoe	2 337	274·2	365	6,346·1	365·17
Vesta's Lady Twylish	H. Hodge, Alton ..	2 212	261·7	319	6,320·8	364·42
Pride of Jersey Brae	T. Church, Te Rapa ..	2 288	269·3	312	6,202·0	332·61
Ruth of Gamboge ..	J. Rae, Taneatua ..	2 325	273·0	280	5,713·0	324·50
<i>Three-year-old.</i>						
Meadowvale Pegasus	E. O'Sullivan and Sons, Tariki	3 47	281·7	324	10,247·2	618·72
Eaton Ladybird ..	R. L. Parkin, Fitzroy	3 312	308·2	365	8,468·9	564·94
Meadowvale Good Hope	E. O'Sullivan and Sons, Tariki	3 234	300·4	365	10,678·5	555·86
Pulchra's Queen ..	A. L. Hooper, Mahoe	3 80	285·0	305	9,228·1	502·17
Perdita	A. L. Hooper, Mahoe	3 9	277·9	327	8,900·7	470·81
Cream of O.K. ..	T. Linn, Mangatoki ..	3 361	313·1	259	7,749·6	460·10
May Day's Favourite	D. P. F. Malone, Kaponga	3 234	300·4	331	6,489·6	425·10
Glenwood's Princess	W. J. Chynoweth, Cambridge	3 280	305·0	365	5,984·3	412·84
Penrose Queen ..	J. B. Clemow, Stratford	3 334	310·4	365	6,767·8	403·38
Beautiful May ..	J. A. Dobson, Kaimata	3 261	303·1	343	6,142·75	373·47
Lily Chase ..	J. I. Whitehouse, Ellerslie	3 325	309·5	353	6,071·0	358·29
Orielton Jutland ..	B. Tripp, Gleniti ..	3 21	279·1	312	7,749·7	357·48
Heather Queen ..	Kendrick Bros., Tariki	3 333	310·3	319	5,538·7	321·99
Luna of O.K. ..	J. Meuli, Normanby ..	3 300	307·0	342	5,453·0	313·40
<i>Four-year-old.</i>						
Woodstock's Princess	H. J. Burrell, Bunnythorpe	4 338	347·3	365	11,635·9	649·16
Snowlette	H. J. Burrell, Bunnythorpe	4 316	345·1	365	9,485·6	529·78
Decision	W. H. Miers, Rukuhia	4 342	347·7	365	10,513·1	523·00
Fancy Free ..	Mrs. A. Banks and Son, Kiwitea	4 247	338·2	365	11,330·2	491·91
Eilcen's Lady ..	C. A. Care, Cambridge	4 254	338·9	365	9,147·9	481·35
Patch's Lizzie ..	W. Anderson, Aokautere	4 86	322·1	365	8,606·8	475·79
Dorothy Dainty ..	S. Atkinson, Papatoetoe	4 326	346·1	365	8,445·9	460·68
Magnet's Lady ..	T. Linn, Mangatoki ..	4 359	349·4	290	6,655·4	388·60
Prudence of Meadow Brook	A. E. Western, Hawera	4 86	322·1	296	6,563·6	327·17

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.

JERSEYS— <i>continued.</i>						
<i>Mature.</i>		Yrs. dds.	lb.		lb.	lb.
Woodstock's Baby ..	Mrs. A. Banks and Son, Kiwitea	5 2	350·0	365	12,881·8	690·16
Jessica's Maid ..	Muggeridge Bros., Manaiia	7 337	350·0	365	11,065·1	679·30
Peaceful	A. and J. O'Donnell, Inaha	5 359	350·0	365	11,772·3	635·07
Erin's Lone Star ..	E. O'Sullivan and Sons, Tariki	5 330	350·0	365	10,386·0	614·38
Enchantress ..	H. Salway, Bell Block	5 322	350·0	365	10,873·3	583·49
Mulberry Gem ..	R. L. Parkin, Fitzroy	8 357	350·0	358	8,626·6	578·84
Marion	H. Hodge, Alton ..	6 148	350·0	345	10,933·3	553·37
Spring Song ..	A. and J. O'Donnell, Inaha	7 300	350·0	365	12,076·7	550·04
Ngamotu Weka ..	W. H. Miers, Rukuhia	8 120	350·0	365	10,668·1	545·80
Rosy Creek Merry Fairy	A. and J. O'Donnell, Inaha	8 264	350·0	365	9,839·0	531·09
Oaklea's Lassie ..	W. Duff, Auroa ..	7 297	350·0	349	8,463·0	524·95
Sunflower's Leila ..	P. J. Linn, Normanby	*	350·0	319	10,001·3	522·56
Frisky Primrose Trixie	T. Church, Te Rapa ..	7 361	350·0	345	9,406·7	497·56
Penrose Vixen ..	J. B. Clemow, Stratford	6 289	350·0	365	7,962·7	493·12
Waipiko Mozelle ..	H. Hodge, Alton ..	7 6	350·0	334	8,761·3	466·15
Floria's Delight ..	J. F. Vosper, Matamata	8 278	350·0	353	8,164·5	460·02
Datura's Fancy ..	H. Hodge, Alton ..	7 332	350·0	324	9,906·8	439·56
Christine	E. S. Walker, Stratford	5 10	350·0	296	7,371·0	409·68
Rangitima Tinsel ..	F. Hoskin, Matapu ..	8 149	350·0	290	6,954·8	363·65
Queen's Bess ..	F. Hoskin, Matapu ..	7 64	350·0	308	7,626·7	363·10
Meadow Queen's Ruby	T. Linn, Mangatoki	6 344	350·0	272	6,824·6	362·00
Amity	A. E. Western, Hawera	5 318	350·0	332	6,251·5	351·68

FRIESIANS.						
<i>Junior Two-year-old.</i>						
Ellesmere Fancy ..	T. H. Overton, Lakeside	1 330	240·5	342	10,466·8	420·77
Holland Queen Mona	S. Clements, Hamilton	1 308	240·5	365	10,772·6	401·71
Clover Pledge of Glen Lynne	S. Clements, Hamilton	1 305	240·5	365	11,507·9	370·80
Marchioness O'Gowrie	J. J. Walker, Ohangai	1 288	240·5	365	11,698·6	367·50
Lady Bountiful Domino	H. Johnson, Stratford	2 7	241·2	365	10,938·0	366·45
Poplarviolet Pietje Pride	J. J. Walker, Ohangai	2 17	242·2	326	9,162·3	319·56
Cloverdale Ivy ..	A. Thirlwall, Matamata	2 41	244·6	281	7,756·9	276·69
Sadie Van Friesland Park	C. A. Fawcett, Clevedon	1 228	240·5	347	6,015·3	246·07
<i>Senior Two-year-old.</i>						
Oakwood Betty ..	W. D. Hunt, Invercargill	2 283	268·8	365	15,973·2	606·53
Holland Queen Woodcrest	J. S. Bairstow, Ruahata	2 252	265·7	326	13,663·2	465·68
<i>Junior Three-year-old.</i>						
Woodland's Cliffside Neta	W. Dew, Riverlea ..	3 63	283·3	300	12,382·2	462·95
Riverlea Lunta's Dutch	C. H. Steadman, Waikiekie	3 138	290·8	350	10,514·8	361·07

* Mature.

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.

FRIESIANS— <i>continued.</i>						
<i>Senior Three-year-old.</i>		Yrs. dys.	lb.		lb.	lb.
Bainfield No. 4 ..	W. D. Hunt, Invercargill	3 255	302·5	365	12,356·0	550·44
Kittannora Alcartra	R. Colee, Greendale ..	3 264	303·4	365	14,937·0	471·04
Lady Josina Segis ..	C. R. Duncan, Whangamarino	3 197	296·7	365	12,470·7	461·65
Oak de Kol Fobes II	C. H. Steadman, Waikiekie	3 190	296·0	325	9,973·6	342·13
<i>Junior Four-year-old.</i>						
Viola's Pietertje Gem	J. J. Walker, Ohangai	4 21	315·6	365	13,724·4	546·12
Monavale Claudia Paxton	J. H. Wilson, Matamata	4 44	317·9	285	9,715·0	380·93
Expiation	W. H. Southcombe, Patea	4 12	314·7	296	9,760·6	367·21
<i>Senior Four-year-old.</i>						
Belle Fayne Segis ..	C. Goble, Piakau ..	4 332	346·6	365	19,568·6	702·25
Marlo Belgian Lassie	J. H. Wilson, Matamata	4 310	344·5	310	11,898·0	395·46
<i>Mature.</i>						
Friesland Wild Rose	W. I. Lovelock, Palmerston North	5 323	350·0	365	17,616·8	637·62
Bainfield Delhurst ..	W. D. Hunt, Invercargill	5 102	350·0	365	14,295·8	559·92
Lady Viola de Kol ..	Parkinson Bros., Opotiki	8 334	350·0	361	14,366·0	543·56
Princess Julip	J. H. Wilson, Matamata	6 4	350·0	299	11,313·9	508·86
Manor Beets de Kol ..	H. H. Hicks, Turua ..	5 6	350·0	306	13,877·0	482·15
Johanna Creamelle ..	T. W. Crossen, Selwyn	5 317	350·0	322	12,473·4	468·68
Bell No. 3	J. H. Wilson, Matamata	6 351	350·0	319	11,088·8	390·49
Empress Burke de Kol	Parkinson Bros., Opotiki	7 122	350·0	306	9,755·4	354·21
MILKING SHORTHORNS.						
<i>Junior Two-year-old.</i>						
Cloverlea Queen ..	D. Buick, Palmerston North	1 335	240·5	365	7,527·2	317·80
Willowbank Sunshine	S. G. Morgan, Ngawapurua	2 53	245·8	365	6,075·9	275·11
Miss Massey A. ..	J. M. Whitham, Glenbrook	2 26	243·1	343	6,870·9	265·67
<i>Senior Three-year-old.</i>						
Terrace View Rosy II	T. De la Haye, Ngawapurua	3 360	313·0	365	13,270·8	577·00
<i>Mature.</i>						
Waitangi Madam ..	A. J. McGovern, Kio-kio	..	350·0	343	13,391·2	593·05
Parakau Gertrude ..	J. W. Anderson, Piarere	..	350·0	300	12,538·3	570·55
Dominion Jean of Ruakura	Ruakura Farm of Instruction	..	350·0	344	13,391·4	532·61
Birkland Daisy	G. N. Bell, Palmerston North	..	350·0	365	12,067·0	474·21
Paeakau Gem	J. W. Anderson, Piarere	..	350·0	301	10,078·7	459·63
Terrace View Pansy	T. De la Haye, Ngawapurua	..	350·0	365	10,468·0	450·30
Rushmere Poppy ..	W. H. Brewster, Feilding	..	350·0	365	11,120·5	449·46
Leeston Pet	J. Smith, Dannevirke	..	350·0	323	10,071·75	443·17
Parakau Biddy ..	J. W. Anderson, Piarere	..	350·0	298	10,634·5	443·06

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
MILKING SHORTHORNS— <i>continued.</i>						
<i>Mature—continued.</i>		Yrs. dys.	lb.		lb.	lb.
Newstead Beauty ..	S. Lye, Newstead ..	..	350·0	336	10,860·7	417·54
Bushby Park Polly ..	S. Lye, Newstead ..	..	350·0	365	10,916·2	409·85
Newstead Champion ..	S. Lye, Newstead ..	..	350·0	350	11,033·2	402·34
Rushmere Granny ..	W. H. Brewster, Feilding	..	350·0	365	10,785·5	382·38
Parakau Florrie ..	J. W. Anderson, Piarere	..	350·0	303	9,558·75	372·17
Parakau Queenie ..	J. W. Anderson, Piarere	..	350·0	309	9,300·7	371·52
Netherby Mona III	R. Turnbull and Son, Sentry Hill	5 34	350·0	343	10,194·3	370·74
Lake Farm Dolly ..	J. E. Leeson, Morrinsville	8 22	350·0	286	9,132·7	362·63
Pukerimu Red Rose II	J. Fisher, Pukerimu ..	5 365	350·0	299	9,129·5	361·82
Lake Farm Ada ..	J. E. Leeson, Morrinsville	10 335	350·0	333	9,685·0	353·05

TOMATO-CULTURE AT THE COOK ISLANDS.

E. A. REID, Rarotonga.

TOMATO-GROWING for export to the New Zealand markets has become an important industry at the Cook Islands, and there is no reason why it should not become a permanent one, both soil and climatic conditions in Rarotonga being favourable for the cultivation of the tomato. Imported tomatoes are in demand in New Zealand from June to the end of November, while local supplies are off the market, and provided the fruit is carefully packed in uniform cases the Rarotongan growers can command the market during that period.

The following matter has been prepared with a view to assisting the less experienced growers, and as a guide to those who contemplate taking up the business. The local tropical references may also be of some interest to New Zealand horticulturists.

PREPARATION OF THE SOIL.

The tomato thrives on our island beach soil, well drained swamp-land, and on the mountain land, and with proper treatment of these soils it grows to perfection.

In regard to the mountain land, this soil is principally red clay, humus, except in a few depressions, being lacking. When ploughed, dress the soil with 20 cwt. of lime to an acre, and lightly harrow it in. Native coral lime will answer admirably for this land. Fresh roche-lime is apt to destroy any humus matter which may be in the soil, and the native lime is not so active. Do not pough the lime into the soil, as much of it would then be lost by the heavy rains which prevail in Rarotonga washing it into the subsoil.

The drained swamp-land will require a dressing of from 20 cwt. to 25 cwt. of fresh burnt or roche lime per acre. This class of land contains much residue and humus which has been washed from the mountains by the heavy rains. It is really our most fertile land, but requires a strong dressing of fresh lime to correct the acidity. The fresh lime will act more quickly than ground limestone, and for this class of soil it is preferable. Applications of lime pulverize the stiff clay soils, remove acidity, and at the same time render mineral substances into a suitable condition for plants to assimilate.

The beach soils contain a large percentage of decomposing coral, therefore a dressing of lime can be dispensed with, but before growing tomatoes a crop of cow-peas should be grown and ploughed in to provide a store of nitrogen and humus for the benefit of the tomato crop.

PROPAGATION.

Too much care cannot be exercised in the propagation of tomato-plants, and unless a grower is prepared to give thorough attention to this work and follow approved methods he would be well advised to leave tomato-culture alone and devote his time and labour to some other occupation more in keeping with his capabilities.

In seed-selection the grower should exercise every care to select only the best fruit from the varieties most suitable for the export trade—whether from the main crop or plants raised from new seed. A small quantity of the latter should be introduced every season from a reputable seedsman for the purpose of preserving vitality and keeping the strain from deteriorating and becoming susceptible to disease.

The first sowing for commercial purposes should be made during the end of March or the first week in April. Kerosene-cases cut in half make serviceable seed-boxes. These should have at least five holes of 1 in. diameter bored in the bottom, then a layer of gravel, to ensure proper drainage. Fresh-sieved soil is then placed in the box, and the seed sown broadcast and then lightly covered with more soil. Where fresh soil cannot be procured the soil for the seed-boxes can be sterilized by lighting a fire under a sheet of iron set up on stones or bricks, the soil being then placed thinly on the iron, and kept stirred or turned until heated to 210° F. This process will kill all weeds and insect life which may be present. The soil should then be left for some days for the action of sun and rain to restore to it, in some measure, the plant-nutritment which will have been destroyed by the heating process.

When sown, the boxes should be placed under the shade of light-foliaged trees—*Poinciana regia*, for instance—or a half-shade seed-house built of a rough framework and roofed with split bamboo, and the boxes placed on benches under this shade. A house of this description is very useful for raising other plants as well as tomatoes, as it affords necessary protection from the strong tropical sun.

When the seedlings are sufficiently grown to enable handling without injury they should be pricked off into boxes similar to those used for the seed. The plants should be placed at least 2 in. apart. In about twelve days the plants should be sufficiently grown for hardening off. Gradual exposure to the sun is necessary to prevent scalding. Place the boxes in the open during the afternoon. After a few days the plants will be fit for planting out. Some growers cover the shade-



A TOMATO AND BANANA PLANTATION AT RAROTONGA.

This plantation comprised 32,000 tomato-plants, in 4 ft. rows, 2 ft. apart in the row. The bananas are planted 20 ft. by 10 ft., and were five months old when the photo was taken.



ANOTHER VIEW OF TOMATOES AND BANANAS, WITH MANIHOT (TAPIOCA)
IN FOREGROUND.

house with coconut-leaves instead of bamboo slats; and when the plants are ready for hardening off they remove a few of the leaves each day, so that the plants will gradually become accustomed to the strong sunlight.

When transplanting knock off a side of the box, then each plant can be taken with a ball of earth, using a hand-trowel for the purpose. With care there should be no losses in transplanting.

PLANTING OUT.

The distance recommended for planting out is 4 ft. between the rows and at least 2 ft. between the plants, the rows running north and south. A space of 4 ft. between the rows allows the use of a cultivator, and, moreover, is a convenient distance when planting tomatoes between rows of bananas 20 ft. apart. The growing of bananas with tomatoes is recommended, as tomatoes should not be grown in the same soil for two successive seasons, while planting bananas 20 ft. apart and 10 ft. in the rows gives two crops for the same cultivation, and utilizes manure which may not become fit for assimilation by the tomatoes during the short season they are growing. Moreover, when the tomato crop is finished another row of bananas can be planted 10 ft. apart, thus giving all banana-plants a distance of 10 ft. by 10 ft., a useful distance for keeping the land in good tilth.

TRAINING.

The single-stem system is advocated for training tomatoes, as it allows of free cultivation, and there is no superfluous growth to harbour insect pests and fungus diseases, thus enabling spraying for their control to be easily and thoroughly accomplished. Also the plant is under complete control, and to get the best results this is imperative.

In training for single stem use stakes 5 ft. 6 in. long, and as the plant develops tie it securely, but not too tightly, to the stake with raffia or any soft tying-material. As the lateral growths appear they are pinched out. When a truss of fruit is set cut away the overhanging leaf to prevent shelter for caterpillars attacking the fruit. Other leaves removed are those which come in contact with the ground at the foot of the plant, but these are only cut away when the plant is developed. The plants are stopped or headed at the first leaf above the sixth truss of fruit, but five trusses are sufficient for a commercial plant, as reliance can then be placed on practically all the fruit being fully developed and suitable for commercial purposes. Leaves growing from the fruit-truss should also be removed, thus giving the fruit full benefit of nourishment.

CONTROL OF PESTS AND DISEASES.

As soon as the plants have started to grow after being transplanted spraying must be attended to. For caterpillar or leaf-eating insects use 1 lb. arsenate of lead to 30 gallons water. Mix the arsenate of lead with a little water in a bowl, then add to the 30 gallons of water. Stir the mixture thoroughly before filling the spray-pump. Spray every fourteen to eighteen days, or as soon as the insects make their appearance.

For fungus diseases use bordeaux mixture, a convenient quantity of which is made as follows: Dissolve $2\frac{1}{2}$ lb. of sulphate of copper

with hot water, or by suspending in sacking in 15 gallons of water. Slowly slake 4 lb. lime by sprinkling with water. When slaked add 15 gallons of water, and pour both the sulphate of copper and lime solutions together into a cask and stir. Always use a wooden utensil for sulphate-of-copper solutions, and never allow the mixture to stand for more than eight hours.

Bordeaux can be advantageously used combined with arsenate of lead. A solution is then available for dealing with both fungus diseases and insect pests in one operation, which is a saving of time and labour.

The Vermorel Eclair knapsack fitted with Vermorel nozzle and elbow extension is one of the best pumps for spraying tomatoes; even with



PACKING TOMATOES FOR EXPORT AT RAROTONGA.

The variety shown is Trucker's Favourite.

Native usage they do not readily get out of order. New sets of valves are easily procured, and fitted with little trouble or expense.

Eelworm: This is one of the most troublesome pests to deal with. Clean soil for the seed-boxes and a rotation of crops is essential for success. For seed-boxes a useful virgin loam or a leaf-mould should be used, and if there is a difficulty in procuring these sterilize the soil.

MANURING.

Provided a useful loam or mould is procured for seed-boxes, and the land has not previously been cropped, no manure will be required until the first flowers are noticeable. Superphosphate can be then applied between the rows and lightly worked in with the cultivator. In a climate with a heavy rainfall, like that of Rarotonga, basic slag might prove of more benefit, but nothing definite can be advised until experi-

ments in this direction have been conducted. Where land has been previously cropped a mixture of bonedust, blood, and superphosphate is beneficial, and when bananas are also planted in the same area this mixture proves excellent for both tomatoes and bananas.

As regards green manure, cow-pea is without doubt one of the best legumes to grow in the tropics. The seed can be sown broadcast or in drills, and if the growth is ploughed in when the plants are in flower it will provide both humus and nitrogen for a succeeding crop.

VARIETIES.

A collection of 122 varieties of tomatoes has been grown at the Experimental Nursery, Rarotonga, and tested for commercial purposes. The following varieties proved good croppers and produced solid smooth fruits excellent for export: Cooper's Perfection, Sutton's Satisfaction, Sutton's Eclipse, Trucker's Favourite.

CROP-ROTATIONS.

As already mentioned, tomatoes should not be grown two years in succession on the same ground, and methodical crop-rotations are therefore advisable. The following is recommended as a good course: Tomatoes, cow-peas, kumaras, cow-peas—after which tomatoes can again be successfully grown.

BLACK-WATTLE BARK FOR TANNING.

STRIPPING, CRUSHING, AND PLANTATION MANAGEMENT.

J. F. SHEPHERD, Manager, Te Kauwhata Horticultural Station.

INQUIRIES have been received lately regarding the method of stripping and handling the bark of the black-wattle (*Acacia decurrens*) for tanning purposes. The Department is in a favourable position to afford first-hand information on this subject, having extensive old-established plantations of black-wattle on part of its horticultural-station property at Te Kauwhata, in the lower Waikato district. For many years past bark has been stripped there, and crushed at a mill on the property. A brief account of the practice followed at Te Kauwhata, together with some general notes on the subject, will therefore be useful.

Stripping is commenced in October, after the sap is up in the trees, as shown by the flowering, and is continued in November and December. The bark will not strip well unless the sap is moving. A preliminary work, where necessary, is to cut cart-tracks into the plantation to facilitate the transport of the bark, which is heavy stuff.

The method of stripping is to ring the tree with an axe 4 ft. or 5 ft. from the ground, and pull off the bark below this cut with the aid of a small crow-bar. As much bark as possible is then pulled off above the incision by an upward jerking motion. The tree is then cut down, and any other easily removed bark pulled from the larger limbs, &c.

It is not good practice to strip trees of less than 6 in. diameter, though as a matter of expedience many of those taken are of less measurement. The general principle followed at Te Kauwhata is to take out the best trees and allow the lesser or younger trees to develop, trees at various stages of growth and development being found in the plantations. A great deal of natural regeneration by the growth of seedlings is going on all the time.

The next operation is to cut or break the stripped bark into lengths from 3 ft. to 4 ft. long. The pieces are tied up with flax in moderate-sized bundles of about 80 lb. weight, and the latter stood up on end to dry. The bark is left in this condition for about three months (the summer season), when it is carted in, and most of it put under cover in the mill building for a further period of drying. It is found that if the bark gets wet at this stage it becomes tougher for crushing, and loses weight and some of its tannic acid. The drier the bark the better it crushes.

At Te Kauwhata the stripping and bundling is usually done by Maoris at contract rates. The work is fairly hard, and rough on the hands, and mosquitoes abound in the plantations. The job is therefore not usually sought after by local pakeha workers. The current rate for stripping and bundling is £1 5s. per ton green weight. The Maoris make on average about £1 5s. to £1 10s. a day, or even more. Contracts are often worked on family lines, the women taking an effective part and also making good wages.

Bark-crushing at the mill is a good winter or wet-weather job. The bark is very fibrous stuff, and the process is rather one of shredding than crushing proper. A great deal of fine dust is produced in the operation, and a flue is provided to carry this off from the machine. An engine of about 9 horse-power (steam) is required to work an average-sized crusher. The Te Kauwhata mill is provided with a 14 horse-power engine, but this is also used for sawing firewood, &c.

There is a ready local market in Auckland and elsewhere for wattle-bark, either crushed or uncrushed. The crushed stuff ready to go into the tan-pits is, of course, preferred by buyers, but producers who have no milling-facilities can dispose of their bark for crushing at proportionate rates. The price of uncrushed bark loaded on trucks at Te Kauwhata Railway-station, at time of writing, is £7 12s. 6d. per ton. Owing to the engine at the mill having been out of commission, the Department has latterly been disposing of its bark on this basis to a tanner in the Auckland neighbourhood. The price of crushed bark may be estimated at about 15s. or £1 higher than the uncrushed article.

On Te Kauwhata experience, an average plantation of black-wattle will take six or seven years to come to the cutting stage. It will then yield, in the first year, about 5 tons (dry weight) of bark per acre. The plantation can be gone through again for cutting every year or two, taking the best trees, as already indicated. If in the course of time a plantation becomes depleted and encumbered with felled stuff it may with advantage be fired, and allowed to regenerate with a clear start. If only parts of the plantation are so treated adequate fire-breaks must be provided.

The production of wattle-bark in New Zealand for tanning purposes is comparatively small, and local industrial requirements are met chiefly by importations from Australia and South Africa, a considerable trade being done with these countries.

Black-wattle, as is well known, makes splendid firewood, and is easily split. It also provides useful timber for farm purposes, such as posts, rails, &c. The posts, of course, are not very durable in the ground, but will serve their purpose for some years. The writer has tried tarring the butts, but finds that this process does not make them last longer. Some action of the tannic acid in the timber on the tar may possibly account for this. The firewood and timber may be regarded as a side-line of the bark-stripping, or *vice versa*, the trees being felled in each case.



CARTING IN WATTLE-BARK AT TE KAUPHATA HORTICULTURAL STATION.

A TIMOTHY PADDOCK IN SOUTHLAND.

W. ALEXANDER, Fields Instructor, Invercargill.

THE present note deals with one of the timothy paddocks on the farm of Mr. R. J. Anderson, of Kauana. Most of the fields are in timothy, but the particular one here described produces the annual seed crop. The area of the seed-paddock is 25 acres. It was sown down in timothy pure at the rate of 20 lb. per acre, and the last season's (1920) crop represents the twenty-first successive year of harvesting for seed. Taking the average over the whole period of twenty-one years, the crop has threshed out annually about 380 lb. of seed per acre. There have been seasons when the yield reached three bags, each of 180 lb., per acre, and, again, when wind has made havoc the threshed yield has been low. An indication of the quality of the seed is given by the official report on the germination of a sample taken from the 1920 crop when it was lying in store. The test was 99 per cent. in six days, with a final result of 99 per cent.

Mr. Anderson's treatment of this field is worth noting. Each season's crop is stacked and threshed in the paddock, with the result that a large

stack of timothy hay is available for winter use. The system is to then stock the paddock pretty heavily early in the winter, usually about May. As the winter progresses and it is known how the hay will last, the number of cattle is steadily increased according to requirements. During the last three or four weeks of its term, prior to being closed up, still more cattle are crowded on to it, and the final condition is that the paddock is carrying anything up to 125 head of cattle of various ages; in fact, Mr. Anderson states that he had as many as 150 on it for some weeks at a time. The result can readily be imagined. The whole field becomes simply black with animal-manure. This manure is then broken up and spread by means of tine harrows worked on their back, followed a week or two later by a set of short-tooth tine harrows worked with tines down. The field is shut up for seed usually before 20th September in each year, and the end of the following February usually sees the seed crop cut.



THE TIMOTHY SEED-PADDOCK AND STACK ON MR. ANDERSON'S FARM.

The cattle have free access to the stack during the whole of their time in the pasture. They eat it, and generally make themselves comfortable round about it. A low hurdle fence, forming a rectangular-shaped enclosure, is erected before the timothy is threshed. The stack is then built completely over it, the outside of the stack covering the fence to a depth outwards of perhaps 6 ft. The cattle can then burrow right in until they strike the fence. The idea of the latter in the first place is to cause the stack to be safe from falling over after having been eaten into. The cattle eating in to a depth of 6 ft. or so provide themselves with a veranda or roof, as it were, this making them just as comfortable as if kept in a loose-box.

The accompanying photograph by Mr. E. Bruce Levy was taken on the occasion of a visit to the farm in August last, and shows some ninety head of cattle around the last season's stack. At that time the pasture looked well and was wonderfully clean. Its condition and the number and quality of the stock, together with the very handsome returns obtained, all speak for the value of the field, and there seems no reason why this productiveness should not be maintained for many years to come.

PRIVATE FORESTRY.

"HOMEBUSH," CANTERBURY.

J. H. SIMMONDS, Auckland.

THE "Homebush" residence is thirty-six miles by road west from Christchurch and 800 ft. above the level of the sea. The estate touches the old moraines and ridges lying along the far-flung foothills of the once much loftier Southern Alps. It is in that happy zone that is reached neither by damp winds from the sea nor by violent blizzards from the mountains. Snow sometimes covers all the land in winter; but it falls gently, and soon again disappears at the touch of the sun through a cloudless sky. There is an annual rainfall of 39 in., which is sufficient for vigorous growth of grass and trees. The subsoil is deep and consists of fairly stiff clay mixed in places with water-worn stones. Very few trees have been uprooted by the wind. A good number have been stripped of their side branches by the snow, but this is an advantage. Here and there a Norway spruce or other tall specimen has been struck by lightning. Loss from these causes has been very small.

It was the late Mr. John Deans who founded the homestead and planted most of the trees. The bulk of the planting was done in 1870, and the work thence continued for about fifteen years. Mr. John Deans did not attempt the impossible task of covering open country with indigenous timber-trees. What remnant of native bush there was he conserved, as he had already done at his Riccarton home, near Christchurch; but the planting was practically all with exotics. Things were done that we of to-day with ampler experience would not do. Trees of inferior merit were given equal place with the best. Rapid growers and slow growers were planted together. Spacing of the plants was often too wide. But we have to look at the general result, and not to lose our sense of appreciation in any narrow spirit of criticism. On the part of the original estate now owned by Mr. James Deans and called "Homebush" the plantations total about 100 acres in area. They are exceedingly beautiful; and he would be a dull-minded observer who would not see that they are also of great economic value both for the shelter they give and for their timber-content. We cast no reflection whatever upon the energy and enterprise of the man who did the initial work when we say that the plantations would have been equally beautiful, equally effective for shelter, and very much more valuable for their timber had the inferior species been excluded and the good ones arranged in groups according to their rates of growth and ultimate dimensions. The meaning and importance of these general remarks will become more obvious if we now consider with as much detail as space will permit the several genera and species of which the plantations include representatives.

CONIFERS.

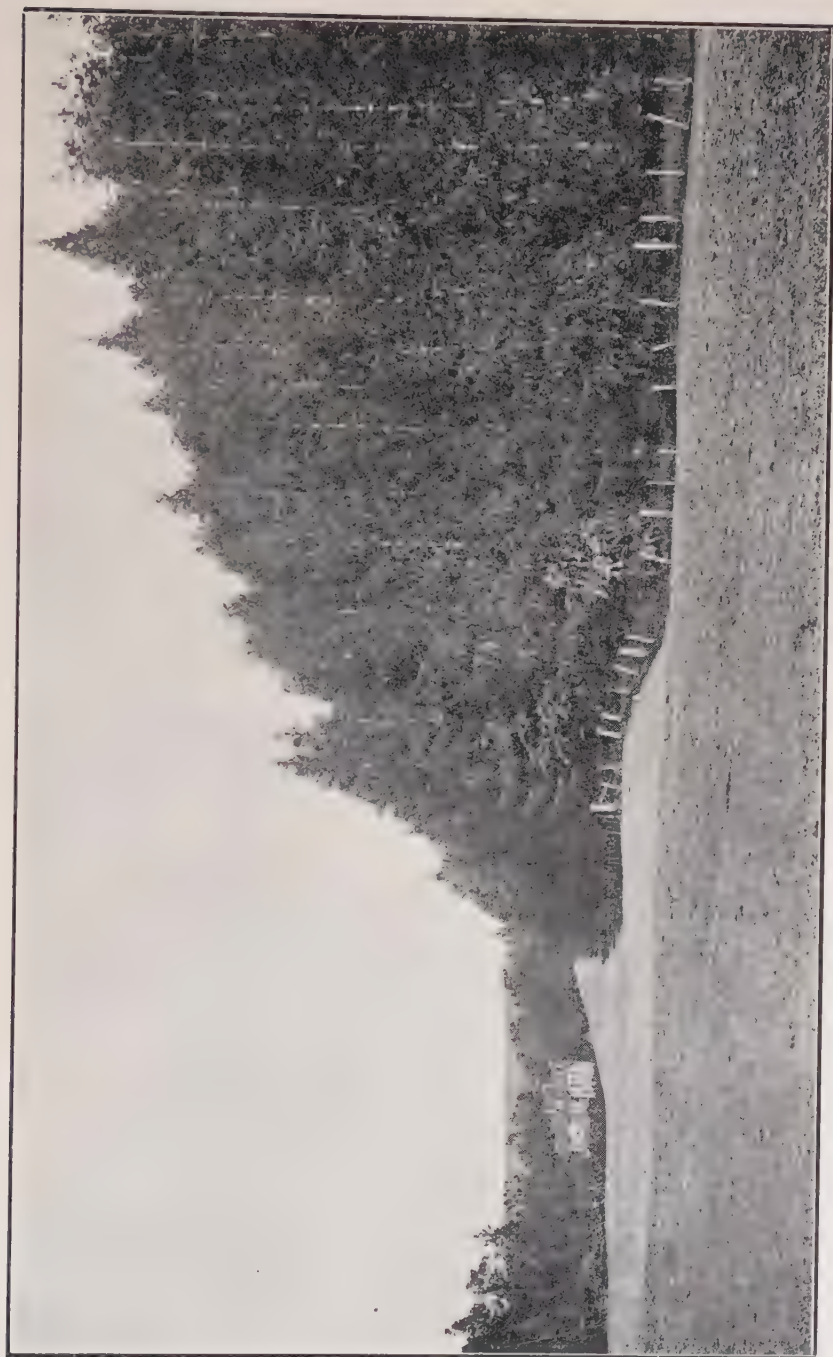
PINES (GENUS PINUS).

Botanists tell us that there are altogether over seventy species of *Pinus*, all indigenous to countries in the Northern Hemisphere. The late T. W. Adams, in a paper published in the "Transactions of the New Zealand Institute," Vol. xlviii, 1915, and separately issued in 1916, mentions fifty-six species as having been experimentally introduced into this country. The following species were noted by the writer as growing at "Homebush":—

Species recommended for General Planting.

Pinus insignis (syn. *P. radiata*).—Original home, Monterey, California. Tree a sturdy upright grower, usually with undivided stem and spreading branches. Leaves in threes, flexible, 4 in. to 6 in. long. Cones 5 in. long, broad near the base and abruptly tapered, heavy; each scale on exposed side of cone terminating in a rounded boss, which on some trees develops into a blunt claw. Of all the pines introduced into this country *P. insignis* easily holds the first place for rapidity of growth and quantity of timber-yield. The sawn product of a tree with a bole 9 ft. in average girth and 40 ft. long will be 2,430 superficial feet. At "Homebush" there are two or three trees each of which would exceed that amount. From sawmillers working in fairly well-planted stands of *P. insignis* between thirty and forty years old we hear what seem to be quite reliable estimates giving an average yield of 60,000 ft. per acre. On the quality and value of the timber for use in dry situations, or where it can be protected by paint, practical experts are gradually forming favourable conclusions. The big *P. insignis* trees at "Homebush" have for many years been scattering fertile seed, and some of their offspring are now lifting their heads far above surrounding vegetation. The example is one of many showing how soon nature would produce forests of this pine if parent trees were established in suitable situations.

Pinus ponderosa.—Original home, western North America. Tree erect, with undivided stem and horizontally spreading side branches. Leaves in threes, rigid, 8 in. to 10 in. long, dull dark green, mainly at ends of branchlets. Cones less abruptly tapering than those of *P. insignis*, 4 in. to 5 in. long; scales armed with slender prickles. The species has found congenial conditions at "Homebush," and is there represented by many millable specimens. The average for the best boles might be 7 ft. 6 in. in girth with 40 ft. in length, which would give a yield of 1,687 sup. ft. per tree. In its native home *P. ponderosa* has a very wide range—hence divergent forms. *P. jeffreyi* differs from the type in the pale blue-green tint of its foliage, in its more finely divided bark, in the larger size of its cones, and in the usually smaller dimensions of the tree. It appears at "Homebush" side by side with the true *P. ponderosa*. Mr. Deans is of opinion that he can also distinguish another form known as *P. Benthamiana*. The behaviour of the species in these plantations shows that it needs close planting to early suppress the side branches. We have not yet milled enough of the timber in New Zealand to form a judgment on its quality, but reports from America place it in a high grade. It is there known as the "western yellow-pine."



A VIEW AT "HOMEBUSH," CANTERBURY.

Mixed plantation on hillside, larch predominating; 20 years old; trees 50 ft. high, and up to 3 ft. in girth. Homestead (Mr. James Deans's residence) in middle distance on left.

Pinus laricio. — Original home, Corsica and South Europe. Tree symmetrical, with undivided stem and branches going off horizontally in nearly regular whorls. Leaves in twos, 4 in. to 5 in. long. Cones 2 in. to 3 in. long, about $1\frac{1}{2}$ in. in diameter; scales without prickles. In Europe this tree is considered a rapid grower, and has a high reputation for the quality of its timber. After full inquiry and considerable experiment our State forests officers have adopted it as a tree for extensive planting. Mr. John Deans, brother of Mr. James, has at "Kirkstyle," on another part of the original estate, specimens of *P. laricio* that are vigorous and beautiful, and give promise of reaching a good millable size within another fifteen or twenty years.

Species that cannot be recommended for General Planting.

Pinus pinaster. — Original home, Mediterranean region. Leaves in twos, thick, rigid, 7 in. to 10 in. long. Cones about as long as those of *P. insignis* but less in diameter, produced in whorls or clusters; scales with projections but without prickles. The tree has a strong tap-root system, but is weak in lateral roots. On the western coast of France, where it is so extensively planted for sand-dune reclamation, the tap-root can descend to a great depth and hold the tree up against the force of the wind. Planted on a gravelly subsoil or on a hard-pan where its tap-root cannot develop it becomes wind-swayed, and consequently makes a curved or crooked bole. In capacity for natural regeneration it surpasses all other pines known to us in New Zealand. Its well-winged seeds are carried far on the wind, and readily germinate and grow wherever sunlight can reach the surface of the ground. At "Homebush," as in so many other localities, a few parent trees have produced a thick crop of seedlings and saplings. If only this tree were of better form and its timber of higher quality there would be for it a very large place in our future forestry; but where and while we can grow the three pines mentioned above it must be excluded from general planting. Even on our coastal areas it is displaced by the more adapted *P. muricata* from western North America.

Pinus Coulteri. — Original home, coast range of California. Tree erect and of handsome form. Leaves in threes, thick, rigid, 9 in. to 11 in. long. Cones very large and heavy, measuring 9 in. to 10 in. in length and 4 in. to 5 in. in diameter; scales armed with very large and sharp-pointed claws turned mainly towards the apex of the cone; remain closed for a long time. Specimens at "Homebush" now about 50 ft. high are bearing cones. They are ornamental, but offer no prospect of a profitable timber crop.

Pinus Sabiniana. — Original home, foothills of California. Tree usually forked low down. Leaves in threes, pendent, 5 in. to 6 in. long. Cones very large and somewhat similar to those of *P. Coulteri*, but differ in being shorter and less tapered, in having the scale claws less acute and turned outward, in the much larger size of their seeds, and in readily opening to allow the escape of the seeds. The rather numerous specimens at "Homebush" have been overgrown by other conifers, and are of no value unless for fuel.

Pinus excelsa. — Original home, North India. Tree with spreading branches and drooping foliage. Leaves in fives, slender, flexible, 5 in. to 6 in. long. Cones pendent on tree, 6 in. to 9 in. long, narrow,

curved; scales when dry very light, marked on exposed surface with slight grooves. Pines with similar but shorter leaves and cones come from North America—*P. strobus* from the eastern and *P. monticola* from the western States. The distinction is not always easy. Trees in the "Homebush" plantations were noted as belonging to *P. excelsa*, but with some doubt. They had been partly suppressed by more rapid-growing trees, but were healthy and had produced cones in great abundance.

Pinus sylvestris.—Original home, North Europe. Tree a rugged erect grower. Leaves in twos, 2 in. to 3 in. long. Cones small; scales without prickles. This pine, though very valuable in Europe, has proved to be unadapted to our climatic conditions, and consequently subject to disease in many localities. There are a few fair specimens at "Homebush," but their size and rate of growth are insufficient to encourage further planting.

DOUGLAS FIR (GENUS PSEUDOTSUGA) (*P. DOUGLASHII*; SYN. *P. TAXIFOLIA*).

Original home, an immense territory in western North America, the best variety or strain being that which grows near sea-level in the sheltered sounds and bays. Tree with erect stem and horizontally spreading branches and branchlets. Leaves somewhat yew-like, hence the second specific name *taxifolia*. Cones a rich brown colour, pendent on the tree, 3 in. to 4 in. long; scales thin but strong, each with an exposed three-pointed bract behind it. The species, though called a fir and resembling generally the firs and spruces, is neither a fir nor a spruce, but belongs to a distinct genus. It is the species that has yielded the exceedingly valuable "Oregon pine" timber of commerce. When propagated from the coastal variety it has found a congenial home over a very wide range in this country. The trees at "Homebush" are splendid. Mr. Deans calculates that he has 150 specimens that would average 4 ft. 6 in. in girth and 40 ft. in length of millable bole. A log 40 ft. long and 4 ft. 6 in. in girth midway between the two ends yields 608 ft. of sawn timber, superficial measurement. The 150 specimens are distributed amongst other trees over a great many acres of land. Had the species been planted pure, and properly thinned, it seems possible that there might have been seventy such trees on an acre of land. That would be 42,560 ft. of "Oregon pine" timber per acre in thirty-five to fifty years. Such a result in so short a period may be too much to expect unless in the most favourable conditions. This, at any rate, is certain: that *P. Douglasii* is a wonderful timber-yielder and perfectly happy in our country.

CALIFORNIAN REDWOOD (GENUS SEQUOIA).

There are two species of *Sequoia*. Both come from western North America. Both are world-renowned—one for the high merit of its timber, the other for its growth to huge dimensions of girth and height. Both are doing well over a wide range in New Zealand. Their prospective importance in our forestry is so great that we may well make their occurrence in the "Homebush" plantations the occasion for describing and commending them.

Sequoia sempervirens.—Tree erect, with horizontally spreading branches. Dead bark persists and ultimately becomes very thick.



SPRUCE PLANTATION AT "HOMEBUSH."

Including *Picea excelsa* and *Picea Sitchensis*. Trees 80 ft. high, 4 ft. girth; 35 years old.

Foliage yew-like. Cones at ends of branchlets, egg-shaped, $1\frac{1}{2}$ in. long. Timber pale red, easily worked, very durable. This is the species that has yielded the Californian redwood of commerce, the high merit of which is well known to all experts in timber. The tree needs a free subsoil and some protection against violent winds; otherwise it is very hardy. It often throws out sprouts from the base of the stem; and if broken or cut down it readily makes new growth. A rooted stump-sprout taken from "Homebush" and planted at "Kirkstyle" is now a vigorous sapling. When exposed to strong saline winds the growing apex of the tree will be cut back; but the writer has not noted a single specimen suffering from disease or premature decay. In Waikato, Wairarapa, Rangitikei, and Wairau trees have in forty to fifty years attained a girth of 9 ft. and a height of nearly 100 ft. In the State forests at Whakarewarewa, in the Botanic Gardens at Christchurch, at "Homebush," and in many other localities there may be seen younger and smaller but equally vigorous specimens. A log 9 ft. in girth and 30 ft. long yields 1,822 sup. ft. of sawn timber. On good land, with proper planting, protection, and thinning, there should be on an acre at the end of forty-five years at least thirty such boles. That would be a total ultimate product of 54,660 ft., to say nothing about the nurse trees and thinnings that would be removed and utilized meantime. *S. sempervirens* has sometimes been spoken of as the most valuable timber-tree in the world, and the evidence is strong for the conclusion that New Zealand could grow it in any desired quantity in many localities.

Sequoia gigantea (*Wellingtonia*).—Tree with erect stem, wide at base and rapidly tapering; side branches numerous but small and horizontally spreading. Dead bark persistent and ultimately very thick. Foliage and twigs somewhat like those of a cypress, but coarser and heavier. Cones at extremities of branchlets egg-shaped, 2 in. to $2\frac{1}{2}$ in. long. The species is represented by vigorous specimens in many parts of both Islands. In Canterbury, as we travel southward or rise to higher altitudes, it appears to have been more generally planted or to be better adapted to the conditions than its congener. The question of relative range is thus suggested for further inquiry and experiment. There are many specimens of *S. gigantea* at "Homebush." Where they have grown up amongst other trees they are tall, clean shafts crowned with vigorous foliage. A good many logs could be obtained 3 ft. to 3 ft. 6 in. in girth and 40 ft. long. The timber is inferior for technical purposes to that of *S. sempervirens*, but is said to be very durable in contact with the ground. Owners of trees should without delay have some of them converted into fence-posts for the purpose of testing this important question of durability.

CYPRESSES (GENUS CUPRESSUS).

Cupressus macrocarpa.—Original home, Monterey, California. Tree in typical form with spreading but not drooping branches. Cones large, as the specific name implies, but not larger than those sometimes produced by another cypress, *C. sempervirens*. Planted amongst other trees at "Homebush," *C. macrocarpa* has held its place and grown to a large size with a clean millable bole.

C. torulosa, *C. Lawsoniana*, and one or two other species of *Cupressus* in the "Homebush" plantations are healthy and vigorous but of smaller

dimensions. Nearly all the members of this genus have credit for yielding timber that will last a long time in the ground.

In the case of *C. macrocarpa* the durability of the heartwood when used as stakes and posts has been proved in this country by competent and repeated experiments. Farmers increasingly realize that they have in this familiar cypress a tree that is easily propagated, rapid in growth, effective for shelter, and capable of yielding at a very early age both high-grade fuel and long-lasting fencing-material. It will strengthen their appreciation to know that at "Homebush" and in many other places the species is freely reproducing itself under the parent trees.

CEDARS (GENUS CEDRUS).

There are three species of *Cedrus*—namely, *C. deodara*, from northern India; *C. Libani*, from Asia Minor; and *C. Atlantica*, from the Atlas Mountains in Africa. The characters common to them all are horizontal or nearly horizontal spread of their branches, leaves in tufts, and firm egg-shaped cones carried erect upon the branchlets. *C. deodara* has the longest leaves and largest cones, and is remarkable for the manner in which its growing tips bend over and droop. *C. Atlantica* has the shortest leaves and the smallest cones, and is rigid in its habit of growth. *C. Libani* is intermediate in these respects between the other two. All are represented at "Homebush," but *C. Atlantica* easily holds the first place for number of specimens, vigour, size, and promise of timber-yield. Several trees have short boles large enough now for sawing into boards. Neither here nor elsewhere, however, does it seem probable that *Cedrus* will ever be a prominent tree in our forestry, unless one or other of the species should be found to produce a timber of much greater merit and value than any of the more rapid-growing conifers. The cedars are certainly very ornamental, and it is much to their credit that they can live and make good growth in exposed situations on the drier plains.

SPRUCES (GENUS PICEA); FIRS (GENUS ABIES).

These two groups are similar in general appearance, but may be distinguished by a study of their cones. The spruces carry their cones pointing downwards, and the scales hold together for a long time, so that perfect cones may often be seen lying about under the trees. The firs carry their cones pointing upwards, and the scales separate and fall apart as soon as the seeds are mature.

Picea Sitchensis.—Original home, western North America. Tree erect, with numerous side branches; bark scaly and rough. Foliage bluish-green. Cones under 3 in. long with thin scales. At "Homebush" this tree has nearly equalled *Pseudotsuga Douglasii* in rate of growth, but it does not present so clean and attractive a bole for the sawmiller. In the North Island and on the lowlands of Marlborough and Canterbury *P. Sitchensis* has grown rapidly for a few years and then declined in vitality. At "Homebush" there is evidence of the same tendency, but only to a slight degree. The inference, perhaps, is that the species requires a still colder climate and more moisture to be entirely beyond the reach of its enemies.

Picea excelsa.—Original home, northern Europe. Tree tall and erect, with rather weak side branches. Cones 5 in. long, narrow, firm, with



SOME BIG SPECIMENS AT "HOMEBUSH."

On left: *Cupressus macrocarpa*, 4 ft. 4 in. girth, 100 ft. high, estimated, 15 years old.
In centre: *Pinus insignis*, 10 ft. 4 in. girth, 100 ft. high; 50 years old.
On right: Douglas fir, 6 ft. 4 in. girth, 100 ft. high; 40 years old.

scales slightly notched at apex. The specimens at "Homebush" are amongst the tallest of the trees, but relatively very small in girth. This species also is failing on the lowlands, and probably has not yet found quite congenial conditions at 800 ft. above sea-level. Several specimens of *Picea* near the residence are understood to belong to *P. Smithiana*. They are healthy, and one of them is about 60 ft. high, with a girth of 4 ft.

Specimens of *Abies* in these plantations understood to belong to *A. pectinata* have reached a height of 75 ft., but are slender in girth. Others believed to represent *A. amabilis* are doing well after a somewhat slow start. The genus includes many species, and a wider range of experiment with them at this 800 ft. altitude would be of great interest and importance to future forestry.

LARCH (GENUS LARIX).

Larix Europaea.—Original home, colder parts of Europe. Tree erect, with rather weak side branches. Leaves in tufts, deciduous. Cones small, light. All trees that are not well clothed with foliage throughout the year are liable to be attacked in this country by fungoid parasites. Larch suffers from this cause as well as from other less obvious troubles. It can withstand its enemies and maintain vigorous life only when it has a cold climate and abundant moisture. At "Homebush" the conditions are a little too mild and dry for it. Mr. Deans finds that it has its best chance of success with him when it is planted in narrow belts alternately with other trees. The timber is light and strong, and useful for making gates.

INCENSE CEDARS (GENUS LIBOCEDRUS).

These are trees with dense foliage, and branches often arranged in a columnar or pyramidal form. The cones consist of a few leathery scales covering the seeds. They are similar to those of *Thuya*, to which the genus is related. Several trees at "Homebush," understood to belong to *L. decurrens*, have reached a fair size and are in good condition; but their rate of growth is too slow for profitable timber production. The kindred genus *Thuya* is represented by healthy specimens of *T. plicata*.

EUCALYPTS (GENUS EUCALYPTUS).

E. globulus (blue-gum).—Original home, Tasmania and south-eastern Australia. Tree too well known to need description. The species requires a deep subsoil and plenty of moisture. A few specimens at "Homebush" have found these conditions and are of gigantic dimensions.

E. viminalis.—Original home, south-eastern Australia and Tasmania. Tree runs up to great height, with straight stem; dead bark usually comes off, leaving smooth white surface. Leaves on young plants sessile, on older trees stalked, long, narrow. Buds and seed-cases in threes, rather small. Heart-wood fissile, straw-coloured; has lasted twenty years in the ground. There are at "Homebush" a few good specimens. The species should be planted where there is a free subsoil and plenty of moisture.

E. obliqua.—Original home, Tasmania and south-eastern Australia. Tree an erect grower with spreading top; dead bark persists on stem and branches and is fibrous. Leaves broad, unequal-sided. Buds pale, club-shaped, in clusters (umbels) of indefinite number. Seed-cases rather large, egg-shaped. Timber fissile, pale; very valuable for work above ground, only moderately durable in ground; good fuel. "Homebush" has a few large specimens.

E. amygdalina.—Variety with very narrow leaves. A few fair specimens.

E. Stuartiana.—Eastern Australia. Tree low and spreading. Dead bark persists and is subfibrous. Buds usually in sevens. Seed-cases top-shaped, three-celled. The species is of inferior merit and should not be further planted. A few specimens.

E. Risdoni.—Tasmania. Tree medium in size, often spreading and low. Dead bark comes off, leaving smooth grey surface. Leaves on young plants sessile; on older trees stalked, long. New foliage and buds glaucous. Seed-cases in clusters of indefinite number, broad top-shaped. Timber fissile, pale, said to be durable in ground. Two vigorous young trees were noted at "Kirkstyle."

E. regnans.—South-eastern Australia. Tree erect, rapid grower, ultimately very tall. Dead bark falls away from branches and upper stem, but persists on lower stem and is there fibrous. Leaves similar to those of *E. obliqua*. Buds in clusters of indefinite number. Seed-cases small, top-shaped, three-celled. Timber fissile, good for any work above ground. Vigorous specimens were noted near "Homebush" in one of the Selwyn Plantation Board's areas.

VARIOUS OTHER GENERA AND SPECIES.

OAKS (GENUS QUERCUS).

Quercus robur (English Oak).—Botanists describe two forms of this tree: (a) *Q. pedunculata*, with fruit-cluster on a long stalk and leaves on very short stalks; (b) *Q. sessiliflora*, with fruit-cluster on a very short stalk and leaves on longer stalks. Numerous good specimens at "Homebush" were noted as *Q. pedunculata*, but they were at the time bare of leaves and acorns, so that the question could not be positively settled.

ASH (GENUS FRAXINUS).

Several trees growing in a damp situation at "Homebush" have attained a fair size, and could now be sawn up for tool-handles.

POPLAR (GENUS POPULUS).

Populus nigra.—Tree with clean bole and spreading branches. A few specimens growing near water have reached a good millable size.

P. alba or *P. canescens*.—This tree spreads freely by suckering, and is liable to become a weed. A group at "Homebush" on damp ground presents many stems that might be sawn into narrow boards or into fencing-droppers. Had the same ground been planted with *Eucalyptus regnans* the result would have been a heavier crop of better timber.

P. fastigiata (Lombardy Poplar).—This well-known tree is very ornamental, but as a timber-yielder much less valuable than *P. nigra*.

HORNBEAM (*CARPINUS BETULUS*).

This tree merits a welcome place in the arboretum, but as a timber-yielder it is small and relatively of low value.

CONCLUSION.

The man who understands trees and puts a right value upon them knows when to cut down as well as when to plant. There are few plantations of any considerable size and age that do not need the woodman's axe and saw. Some trees should be removed because they are defective as individuals or because they belong to inferior species; others because they are at the best stage for repaying the cost of planting and subsequent maintenance. Mr. James Deans has the instincts of a true forester. He knows his trees, and has read a great deal about their botanical history. He is well aware that many specimens in his plantations should as soon as practicable be converted to use. A circular saw, driven by a turbine water-wheel, awaits the task of cutting these trees into fuel or into boards and scantling. Many logs have already been sawn up. Domestic fires have been supplied, fence-posts renewed, and buildings repaired with the product. Where there are so many trees the removal of a few only leaves the conditions better for those that remain. Then also there comes the opportunity to under-plant with more valuable species.

■ Nature intended New Zealand to be the home of many forests and its inhabitants to be a tree-loving people. The forests planted by Nature's own hand were great and beautiful; but those that are to be planted by the hand of man, with Nature's aid and blessing, will be equally beautiful and more productive. A study of exotic forestry at "Homebush" and elsewhere north and south discloses this interesting truth: that the most promising of the trees yet introduced, with one or two exceptions, are the conifers from western North America and the eucalypts from eastern Australia and Tasmania. Our forests of the future will include the best of our own indigenous trees and the best and most adapted trees from all other temperate countries. The writer's belief and hope is that New Zealand will then not only supply its own needs, but export large quantities of timber to other markets.

State Nurseries and Plantations.—The annual report of the Forestry Department states that during the year ended 31st March, 1920, trees to the approximate number of 11,724,000 were raised in the four State nurseries, and during the same period 3,710,900 trees were sent out to the various plantations of the Department. The area planted in both Islands totalled 1,972 acres. This area is less than the average, and is accounted for by the fact that, owing to an adverse season at Tapanui, there was a much reduced number of trees for planting out on the plantations supplied by that nursery. The total area now planted in both Islands is 37,416 acres.

WORK FOR THE COMING MONTH.

THE ORCHARD.

REPORTS which have come to hand through shippers from their agents in England relative to the quality and condition of last season's export shipments of apples have varied to some considerable extent. On the whole they were quite as good as expected under the conditions. Some were highly flattering, complimenting us on the appearance, pack, flavour, and condition of our fruit on arrival, and saying that it was better than the best Australian to date. The fruit readily sold at top control prices. Although satisfactory, this may not be taken, however, as definite assurance that the whole arrived in the condition we should have desired. Shortage of supplies at the time may to some extent have accounted for its ready sale, not entirely the merit of the fruit itself.

The most critical report, although it does not condemn our fruit in so many words, goes rather too close to doing so in effect to be altogether comforting—by offering suggestions calculated, in the opinion of the reporter, to considerably improve our future shipments. Apart from minor criticisms the principal one was regarding overmaturity of a proportion of the fruit on arrival. This we fully expected, and are quite ready to admit as being possibly the case. The reporting agent, however, being made acquainted with the fact that the fruit was packed under recently introduced grading regulations calling for certain colour standards, has, in my opinion, erroneously jumped to the conclusion that such overmaturity was due to growers having to defer picking too long in order to allow the fruit to take on that degree of colour required by the regulations.

The remedy suggested by the critic is to pick our fruit green with little or no colour showing, and he claims that such fruit will colour up sufficiently in transit, and will otherwise arrive in a much more suitable condition for sale on the English market. This may be so, but it will be a great pity if such an expedient has to be resorted to. Every grower of experience knows what to expect of immature fruit, such as that described, after being held some two months in cool storage. At best it will be sickly and insipid in colour and flavour as compared with what it should be. If circumstances eventually compel us to ship fruit in the condition suggested it will, of course, have to be done, but the prospects of building up a name and demand for our fruit on European markets will be anything but bright. However, I do not for a moment think that we will be reduced to anything like this condition, the opinions of the English agent notwithstanding.

It must be taken for granted that a proportion of our apples did arrive on the English market in an overripe condition. It is unfortunate that it was so, but, on the other hand, it is fortunate from the point of view of our future apple trade that there were definite reasons for expecting this which were possibly not known or not appreciated by the writer of the report in question. The reason was connected with the unavoidable confusion experienced here during the shipping season through the late allotment of shipping-space, and the uncertainty of space and supplies of fruit—one largely creating the other—with the result that fruit which came to hand was shipped altogether out of its proper rotation and in some instances much beyond its season. A proportion of Cox's Orange, for instance, was shipped over five weeks after being packed. Again, Jonathans, the last of which variety should have been shipped on the "Port Napier," were largely despatched later by the "Corinthic," owing to growers not being in a position to give assurance of their ability to pack them in time to allow another chamber of 16,000 cases to be secured on the "Port Napier." Many of the Jonathans shipped by the "Corinthic" were overmature and too large to suggest an ideal

carrying-condition. These instances alone are sufficient to account for all over-maturity criticisms, but in neither instance was that over-maturity due to holding the fruit too long in order that its colour might comply with the requirements-of the regulations.

As regards future shipments, there is little doubt that few instances will be found of fruit carrying the colour requirements of the "Fancy" grade (where fruit colours at all well) having any more than reached that maturity required for shipment, particularly in view of the slight adjustments which are being made with reference to Cox's Orange and other striped varieties.

Apart from our general experience of the keeping-qualities of fruit, the foregoing view is to some extent confirmed by the result obtained with fruit shipped by the Department to the High Commissioner, London, for exhibition purposes. This fruit before being packed had developed colour in excess of that required by the "Extra Fancy" grade, and it also represented the only lot of fruit relative to which an individual knowledge was available before shipment and on arrival. The fruit in question was reported by the High Commissioner to have arrived in first-class condition and was awarded the highest award at the Cardiff Show.

—J. A. Campbell, Assistant Director of the Horticulture Division.

AUCKLAND.

There are indications this season of a heavy crop of both apples and pears. Stone-fruits are, generally speaking, above the average in regard to crop, and the picking of the early-ripening varieties will be demanding the attention of growers about the middle of the month. Apples will follow in close succession, and, as all available time will then be taken up to a very great extent in the successful harvesting and marketing of these crops, it is imperative that such work as seasonable cultivation, including disking and harrowing, the disbudding of young trees, and the thinning of pip-fruit crops should be pushed on with all speed.

Fire-blight: As indicated last month, the Department is desirous of obtaining all information possible regarding the outbreak of fire-blight in any particular domestic or commercial orchard, and asks any person who discovers what he considers to be suspicious symptoms of this disease to immediately communicate with the Orchard Instructor for the district in which he resides. Although a thorough inspection for this disease is being undertaken, it will be recognized that there will still be a possibility of small infection being missed, or occurring after the visit of the Inspector, and it is hoped that the assistance of all growers will be enlisted.

Spraying summary for the month—Apple, pear, and quince: Arsenate of lead, $\frac{3}{4}$ lb. powder or $1\frac{1}{2}$ lb. paste to 50 gallons water, for the control of codlin-moth, every fourteen to twenty-one days, together with commercial lime-sulphur, 1-90 to 1-100, for the control of fungoid disease.

Peach, nectarine, and plum: Growers are advised to spray with commercial lime-sulphur, 1-120 to 1-125, as a preventive against brown-rot.

Citrus fruits: Bordeaux, 4-4-40, as soon as the fruit has set on the main crop of flowers. Citrus growers are again reminded of the necessity of removing all wood injured by frost during the winter, otherwise it may lead to fungoid trouble or give opportunity for the entry of borer insects.

—J. W. Collard, Orchard Instructor, Auckland.

HAWKE'S BAY.

Ground work: Continue cultivation to break the earth-crust and kill weeds.

Young trees: Useful tree-formation work can be done now by removing surplus and misplaced shoots, but this work should not be carried to excess, or the trees are likely to suffer from the removal of too much leaf surface. Where grafts have failed to take, a well-placed stock growth should be allowed to remain and budded over in season.

Thinning: Young trees up to four years should have all the fruit removed. Where apples and pears have set a heavy crop the fruits may be thinned to advantage. Particular attention should be given to weak-growing trees, and all fruit on the upper parts of the leaders removed. In no instance should fruit be allowed to remain on last season's leader-growth. Stone-fruits will also need attention; endeavour to have each variety thinned before the stoning-period; fruits should not be left touching each other, as brown-rot usually commences at such places.

Spraying : Apple, pear, and quince—For moth, leech, and leaf-roller, arsenate of lead, 1 lb. powder or $1\frac{1}{2}$ lb. paste to 50 gallons. For red mite, scale, mildew, and black-spot, lime-sulphur, 1-100. For woolly aphis, Blackleaf 40, 1-800. If black-spot is troublesome use bordeaux 3-4-50.

Plum—For leech, arsenate of lead, as for apples. For brown-rot and rust, lime-sulphur, 1-120.

Peach and nectarine—For brown-rot, lime-sulphur, 1-120.

Fire-blight : Keep a lookout for dead spurs or twigs on apple, pear, or quince and report at once to the Orchard Instructor.

—W. H. Rice, *Orchard Instructor, Hastings.*

NELSON.

The notes supplied last month regarding orchard spraying and cultivation, also the thinning of the fruit and "stopping," still hold good and are the most important operations for December.

The orchard harvest will commence about the middle of the month with the stone-fruit. To successfully meet the attacks of brown-rot to which this crop is so liable it is necessary to carefully collect infected fruit and properly destroy it. Search the trees weekly while the crop is about. This, together with the lime-sulphur summer spraying, has given very encouraging results.

—W. C. Hyde, *Orchard Instructor, Nelson.*

CANTERBURY.

Pests and diseases of pip-fruits : At the time of writing powdery mildew has made its appearance in the district. Growers should lose no time in spraying with either atomic sulphur, 10 lb. to 100 gallons, or lime-sulphur, 1-100. As an additional measure of control pick off and burn all affected twigs.

Black-spot is in evidence on early susceptible varieties of pears. All trees should be resprayed with lime-sulphur, 1-100, or bordeaux, 3-4-40. For codlin-moth, pear-slug, and leaf-roller, spraying with arsenate of lead (paste 3 lb. or powder $1\frac{1}{2}$ lb. per 100 gallons) should be continued. Apple leaf-hopper and red mite are again prevalent. Apply Blackleaf 40, 1-1,000, or lime-sulphur, 1-100. 3 lb. of soap per 100 gallons of Blackleaf 40 improves the mixture. When soap is added to the Blackleaf 40 do not combine arsenate of lead with the mixture. The spray should be directed to the under-side of the leaves. Repeat the application at intervals of three weeks until pests are got rid of.

Pests and diseases of stone-fruits : In all orchards where red mite and black aphid are present the affected trees should be given a thorough dressing of either Blackleaf 40, 1-1,000, or lime-sulphur, 1-125. Cherry-slug.—Before picking, hellebore powder is recommended to control this pest ; after picking, where necessary, spray with arsenate of lead. Brown-rot.—As a precaution against this disease thin out fruits so that no two touch one another. Spray at intervals of from fourteen to eighteen days with either atomic sulphur, 10 lb. per 100 gallons, lime-sulphur, 1-125, or bordeaux, 3-4-40. Pick and burn all fruit showing signs of infection.

Bladder or pocket plums : This disease is troublesome this season in some parts. Pick off and burn all infected fruits and twigs. Spray with lime-sulphur, 1-125, or bordeaux, 3-4-40.

Silver-blight-infected trees are numerous this season in some localities. Cut out and burn all dead limbs and branches.

Grafts : These will have to be regularly attended to now. Remove all shoots and buds below the graft.

Disbudding : Remove from the roots and trunks all superfluous shoots, so that the energy of the trees will be directed toward the development of leaders and laterals. In young trees surplus and misplaced growth which would have to be cut out at winter pruning should now be carefully removed.

Thinning fruit : In nearly every orchard trees will be found which are carrying a heavy crop of fruit. By the time these notes appear practically all danger from frost should be gone, and it will not be too late to carry out this important work. Thin out sufficiently to give remaining fruits ample room for development. Remove damaged and diseased fruit. All fruit should be taken off towards the tops of leaders of young trees.

Marketing : Neither apricots nor peaches should be allowed to become over-ripe before being sent to the market. As a matter of fact, they should be packed slightly on the green side, as usually a few days elapse before they reach the consumer. By that time they are about in a condition for use. When purchasing

a new supply of cases order the Government-standard-sized cases. Stencil your registered brand legibly on the end of each case. The Government official grade marks, Extra Fancy, Fancy, and C Grade, are to be used only to describe fruits graded and packed according to the standards set out in the regulations.

Cultivation: At this season of the year orchard cultivation should receive special attention. Every effort should be made to reduce the soil to a fine tilth to a depth of about 3 in. in order to conserve the soil-moisture during dry periods. The soil should be stirred after rains as soon as sufficiently dry to work. A hard crust should never be allowed to form.

—W. K. Dallas, *Orchard Instructor, Christchurch.*

OTAGO.

At time of writing the weather is hot and dry, an indication of an early summer and probably a dry one. Where cultivation is not up to a good standard lose no time in attending to this work, a good dry mulch being the best retainer of moisture.

Fruit-thinning will still be in full swing. Pay particular attention to small varieties of apricots, such as Newcastle, thinning out the scabby ones. The result will be greater weight and better quality. Muir and Triumph peaches pay well for careful thinning out, also Burbank plums. Among apples, Scarlet Nonpareil requires special attention, for the trees' sake as well as the crop. All young apple-trees should have the fruit removed from the previous season's growth so as to give the leaders a chance.

Do not wait till you see the effects of codlin-moth. Spray now with arsenate-of-lead powder, 1½ lb. to 2 lb. to 100 gallons, or paste, 3 lb. to 4 lb. to 100 gallons, and follow it up three weeks later at the longest. Fight woolly aphis from the start if you want the best results, using Blackleaf 40, at 1-800. The same applies to black and green aphis on peach-trees. Keep lime-sulphur or atomic sulphur going where fungus diseases are likely to be troublesome. Reference to previous notes will supply all information on these diseases.

—J. H. Thorp, *Orchard Instructor, Dunedin.*

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

MANAGEMENT OF GROWING STOCK.

A MATTER for the poultry-keeper's first concern now is to see that the young stock are fed and managed in such a way as will enable them to make steady growth and healthy development. Where possible the pullet that is about half-grown should be given a free range, as this is one of the secrets of building up desired size and a vigorous constitution. Of course, hand-in-hand with this, good comfortable housing should be provided. This should be draught-proof, but at the same time it should be arranged in such a way that fresh air is available to the chickens at all times. That is to say, while the house must be well opened up in front, there must be no cracks in the sides or back walls. Never forget that compelling a bird to sleep in a draught is the most common cause of colds, which are forerunners of that dreaded disease roup. Generally speaking, a bird is better roosting in a tree than in a house in which the wind whistles through all parts. In addition to being draught-proof the house should be kept in a thoroughly clean condition. Above all, do not overcrowd, or the trouble thus invited may be expected sooner or later.

Exercise is another matter that must not be overlooked. Where roomy outside runs are provided or the birds are allowed a free range these conditions will provide ideal exercising during fine weather. Something more is required, however; the floor of the house should be covered with litter in which some grain food is fed. This will induce the birds to exercise in comfort during unfavourable weather conditions. Some people keep their well-grown pullets in small coops, with merely enough room for the birds to stand up in. This means that when long spells of wet and cold weather prevail the young birds are forced to go out-of-doors and become wet through, or remain under cover where the conditions are anything but what they should be. In such cases it is little wonder that diseased and unthrifty stock are the result.

The next essential in securing profitable and vigorous stock is to see that an ample supply of good but non-forcing diet is provided. A moist mash made of two

parts bran to one part of wheat-meal, or the usual pollard-and-bran mash, should be provided for the morning and midday meals, while crushed plump oats (Sparrow-bills preferred) or broken wheat, maize, &c., should form the evening meal, and be fed in a manner that will encourage the birds to scratch and keep busy. In addition, it is always a good plan to have a dry formula of pollard, bran, ground-wheat, &c., in a separate hopper, and left always before the birds to pick at. Some people give their growing stock dry food entirely, while others give all wet mash except for the evening meal. Both systems have their advantages, but to the writer's mind a combination of both the wet and dry systems will usually give the best results. Then, for stock of all ages a liberal supply of green food is an essential. Indeed, it is safe to say that a growing bird cannot make the best growth if it is stinted of green material at this period of the year. The same may be said in regard to shade, as neglect in this connection is a common cause of chickens making slow growth during hot weather. As a means of assisting digestion, the birds must have grit available to them at all times. It should be remembered that fowls have no teeth, the grit acting in their place, and unless this is always in reach of the birds indigestion and other troubles are bound to follow. Do not neglect to clean and fill the water-fountains daily, as drink is of equal importance as food during hot weather.

It is the present growing pullets that must be looked upon to produce the dear eggs next winter, and if a maximum number of the latter is to be secured it is imperative that the birds be fed and managed to the best advantage during all stages of their development.

BROODY HENS.

In these days of dear foodstuffs it will mean a continual drain on the profits of the poultry-keeper if broody hens are allowed to sit on the nests for days at a time. The day has gone by for considering that the hen is all the better for a natural rest. This not only means a loss in eggs, but the breeding of insect pests is encouraged. Broody hens should be removed from the nest and placed in a broody-coop immediately they show the first desire to sit. It should be remembered that the longer the bird is allowed to sit on the nest, the longer will it take to lose the broody fever. Do not adopt the foolish policy of starving the broody hen; on the other hand, give her as much food as she can eat, in order that egg-laying may be resumed in the shortest time possible.

COCKERELS FOR BREEDING-PURPOSES.

With little or no culling having yet been carried out, and the young stock rapidly gaining in size, the plants of many breeders will fast become overcrowded. To lessen the risk that usually follows, it is now full time that the early-hatched cockerels be gone through, selection made for future breeding purposes, and the rejects got ready for market. In choosing the breeders it is always a wise policy to reserve more birds than are actually required, so that when the final selection is made only the best specimens are retained for future service. Do not forget that very often a cockerel may look ever so promising during the growing stage, but will prove disappointing when mating-time comes round. On the other hand, it will be frequently found that a bird slow to exhibit desirable characteristics makes an outstanding male when fully developed. As a general rule, the cockerel that shows signs of very early maturity, and which is the first to catch the eye in a flock of birds of the same age, seldom or never grows to a desired size, and therefore will never make a desirable sire. In most cases it is the cockerel of fair size and slow to mature, but good on breed-points, that is the most likely one to attain a good size of body and subsequently produce robust stock.

THE APIARY.

G. V. WESTBROOKE, Apiary Instructor.

DURING the coming month all preparations for the honey crop should be pushed forward. The main flow lasts from ten to fourteen days, depending largely on weather conditions. It is therefore necessary to have the colonies in good condition, with the maximum number of field-bees, and everything in readiness for the rapid storing of the nectar when it is available.

Those who use queen-excluders, to prevent the queen ascending and laying in the combs in the supers reserved for honey, should now place them on the hives.

This operation should be done, as far as it is possible to judge, about two or three weeks before the main flow commences. The best results are obtained by lifting all frames of brood—except the one holding the queen—up to the super, filling up the vacant space in the hive-body with clean empty combs or frames fitted with full sheets of foundation. Place the excluder on top of these between the bottom box and the super. An extra super may also be placed on the top. As the bees hatch out above the excluder the cells will be filled with honey. In about seven days it will be necessary to look through these frames to see if queen-cells have been started. If any be found they should be torn down, unless queens are desired from that particular hive. Once the heavy flow is on there will be little danger of swarming.

Should the weather become very hot it is advisable to lift the front of the hives on small blocks of wood so as to raise them about 1 in., to allow plenty of ventilation. Some beekeepers prefer to place the super so that it projects about 1 in. over the one below. This not only allows free ventilation, but gives the field-bees an additional entrance, which is a decided advantage in a strong colony during the heat of summer. Care must, however, be taken to close these outlets as soon as the flow ceases, otherwise there would be a danger of robbing.

From now on for the next two or three months beekeepers will be kept very busy. It is therefore important that they should have a full stock of frames ready wired and filled with foundation, unless they have a large supply of clean empty combs.

INTRODUCING QUEENS.

Those who have ordered early will now be receiving their new queens from the breeders. When these arrive take care to see that they are kept in the shade until required. When first received from the mail, take off the address-card carefully and ascertain if the queen is alive. If she should arrive dead post back the cage intact, and the supplier will usually replace it with another.

Before introducing the queen into a hive make sure that the colony is queenless. It is best to hunt up and kill the queen to be replaced just before introducing the new queen, as a hive that has been queenless for some time will often refuse to accept a new one. Before placing the cage in the hive see that the hole containing the candy is covered only by a small piece of cardboard. This is placed there in order to prevent the bees releasing the queen too quickly. In about twenty-four to thirty-six hours the bees will have eaten through the cardboard, tunnelled their way through the candy, and so left the way clear for the new queen to emerge. By this time they will have become used to her and will usually accept her. After introducing the queen do not open up the hive for at least a week, except for the purpose of quietly removing the cage on the third day if the queen is out. If they have failed to give her an exit by that time, push a stick or pencil through the cage and quietly replace and leave alone for a week.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

TOMATOES: When these notes are published all planting should have been done, and in most cases the plants should have made a fresh start. Spraying should in most cases be regarded as a matter of ordinary routine and should be commenced before there is an appearance of disease. Prevention is easier and better than cure, so a beginning should be made at once, and the spray repeated at intervals of about fourteen days. If heavy rain follows soon after spraying repeat it as soon as the weather is fine. Bordeaux, 4-4-40, may be used, or in place of the 4 lb. of lime use 6 lb. of washing-soda. When the plants begin to grow they immediately push out side shoots. The number of these to be retained will depend on the system of training. If the plants are to be confined to single stems all the side shoots should be pinched off; if to two stems the strongest or best placed

on each plant should be kept. In that case do not hurry to tie the plants to the support, for if they are allowed to bend over the side shoots will advance more rapidly and soon overtake the original leader. The question of fertilizers is a very difficult one, and one on which authorities greatly differ—so much so as to be in some cases in exact opposition. The fact is, of course, that the fertilizers required must to a very large extent be ruled by circumstances, the class of soil, what is in it, and the natural climate. It is agreed generally that the chief requirements of the plant are phosphoric acid, supplied by superphosphate or bone manures; potash, supplied by sulphate or muriate of potash; and nitrogen, supplied by sulphate of ammonia or nitrate of soda. Some growers use blood-and-bone, in which case great caution should be exercised in the use of the nitrogen compounds, for though blood manure is slow in action, if it is applied early—as it usually is—it must become available during the main fruiting-period. The great difference between sulphate of ammonia and nitrate of soda is that the former is slow-acting—it becomes available only by degrees. This compound should therefore be applied early and in one application. Nitrate of soda is immediately available, therefore should be applied only to the growing plant and in small amount. Anxiety to produce growth may lead to a too free use of a nitrogen compound. This should be avoided. Too much nitrogen will produce a luxuriant plant, but it will decidedly delay the maturing of the fruit. Another evil is that it causes a soft growth that is very susceptible to disease. Both evils can to a great extent be counteracted by a proportionate use of potash. The following formula represents the average opinion as to what a tomato-fertilizer should be: 75 lb. nitrate of soda, 200 lb. 16-per-cent. acid phosphate (or 150 lb. steamed bone-meal), and 80 lb. muriate or sulphate of potash, per acre.

Cauliflowers should have been sown about the middle of September. This being an important crop the plants should have special care. It pays to lift the young plants and prick them out about 4 in. apart in a bed of good soil. The plants should be ready to put out finally by the last week in December. The heads come in before the earliest broccoli, and when peas and French beans are over. It pays to treat broccoli-plants in the same way. Properly speaking, the last broccoli-seed should be sown by the end of November, also cabbage and savoy. Broccoli-seeds, however, can be and often are sown later. Such late sowing is, however, only a makeshift, and the result is very uncertain, except that it is certain that only small heads can be got. In the warmest districts it is not very necessary to grow broccoli, except perhaps the earliest, as cauliflowers can be got very early in spring.

Brussels sprouts should be ready for planting out. The best results are got from plants that have a long season of growth. Questions are asked as to whether the leaves on the stems of brussels sprouts should be cut off. The answer is decidedly No. The sprouts cannot develop without the leaves, which should not be taken off until they turn yellow. Plants illustrated in trade catalogues have been denuded of leaves for the purpose of taking the photograph.

Provision for the winter supply of carrots, parsnips, and red beet should be no longer delayed. Silver-beet is very useful in case of failure or short supply of cabbages. It is also useful for poultry. If sown now the plants will be fully developed before winter. The plants sometimes stand for two years. Sow in a small patch and transplant, or in drills and thin to about 12 in. each way. Sow more peas, French and butter beans, turnips, lettuce, and radish. Lettuce should be sown in drills and the plants thinned instead of transplanting. Onions for pickling should be sown at once. Directions were given last month.

Celery: Where the leaf-disease has been experienced spray with 2-2-40 bordeaux every second week, so as to keep the foliage practically covered with the mixture. In cases where spraying has been done from the early stages little or no trouble has been experienced, but once a plant becomes seriously affected it cannot be saved. In the warmer districts celery, and also carrots and parsnips, are frequently attacked by tiny plant-lice. These insects are so small that they usually escape notice until the foliage begins to turn yellow and causes examination. Injury is done by the insects sucking the juices of the plant, and they can very quickly ruin a crop, even in the case of young plants, killing them outright. Spraying with Vistolene or XL-All fluid through a fine nozzle is a sure cure.

Potatoes should be sprayed as a prevention of blight. There is little doubt that if disease-free sets were planted on clean ground and a spray of 2-2-40 bordeaux—half the strength usually employed—given at frequent intervals from the

commencement of growth, disease would rarely appear. When, however, spraying is left until disease is evident the stronger mixture must be used.

Thinning all such crops as require it should be done as early as possible. Thinning is easiest accomplished while the seedlings are small, and the crop is the better for the early thinning. Moulding-up such crops as require it should also be done fairly early. The chief use of moulding-up most crops is to prevent injury by wind. In the case of dwarf beans it is best done in two operations, but cabbages and the like may stand longer. It is usually possible to make the moulding serve a double purpose by performing the operation when weeds require attention. The weeds are cut out or smothered without separate attention. Potatoes require at least two mouldings, the first to support the haulm, the second to ensure the tubers being well covered with soil. Where the potato-moth is troublesome special attention should be given to forcing the soil well among the haulm. The operation of moulding usually leaves a kind of trough along the ridge in which the haulm is standing. This trough should be filled so as to keep the moths from the tubers as far as possible.

SMALL-FRUITS.

Strawberries: The earliest runners should be cut off, the first consideration being the fruit. When the main crop has been gathered there will be time enough to make runners. It is usual to let runners root only in certain rows, which need not be trodden on. The runners are often allowed to make too many plants. This haphazard way results in a great number of the plants being too small to bear a good crop the first year; good plants alone can do so. The runners should not be allowed to make more than two plants each, and no more should be allowed on a plant than can have room for fair development. To allow the plants to make a mat is to produce weakly runners, and also to weaken the parent plants and lessen the next crop.

Raspberries: Keep the soil between the plants well cultivated, so as to suppress weeds and suckers. A sharp spade or strong hoe should be used to grub suckers between the stools.

Gooseberries and red currants: Bushes should be looked over and any gross young shoots appearing at the base or in the centre should be broken off; a downward tug will fetch them out at the heel.

Black currants: The plants should be allowed to push up a few new shoots from the base, but not more than are wanted should be left, as if the bush is crowded the buds cannot mature. The fact that the black currant bears fruit on the previous year's wood is the cause of some error in treatment. The fact is that the fruit on the young wood is supplementary to the main crop which the older wood should produce. In Europe, and even in the southern parts of New Zealand, it was formerly the custom to spur-prune the black currant, also the gooseberry, in which case, of course, all the fruit was produced from old wood—and very fine crops too. In these days a different method of pruning is adopted, by which a certain amount of the crop is taken from young wood, and this applies alike to gooseberries and black currants. Certain bad effects were produced by close spur-pruning; for one thing there was the production of a large number of shoots that required stopping in summer, giving needless work. In all but the coldest parts of the Dominion this close pruning and summer stopping led to crippling the plants, which became enfeebled, and many died. These evils were prevented by allowing greater freedom in the young wood, and healthier trees resulted. But still the fact remains unaltered that most of the fruit is borne on the old wood, or, rather, on spurs and shoots on the old wood. Therefore the interior of a bush must not be crowded. If it is there will be but part of a crop, and that will be mostly on the young wood on the outside of the bush.

Red currants: These do not bear on the young wood, but only on spurs on wood that is at least two years old. The aim of the grower is therefore to form an open bush, so that light can reach every part. The exact plan of bush matters little, but no doubt the open cup form is best, as it produces a system that can be followed. Main branches are led up in the usual way. All side shoots are shortened: first when they have grown about 12 in. they are reduced to 6 in.; this is, of course, during summer. Finally, in winter these shoots are cut back to short spurs about $\frac{3}{4}$ in. long. Note that the first shortening should not be more than stated. If it were it would cause the basal buds to break into wood-growth and the fruit-spur would be gone.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

POISONOUS HONEY.

H. F. M., Matata :—

I would like to know if there are many flowers which yield poisonous honey. Rangiora scrub is abundant here, but I believe that in its case the poison evaporates. However, there are said to be other plants much worse in their action, and I have heard a small yellow swamp-flower blamed, but do not know if this is correct. There have been several cases of severe poisoning in the district, one at Waimana being fatal, and the advice usually given is, "Do not touch wild honey." But there cannot be any difference between wild and apiary honey where scrub (not bush) is so abundant. Some say that if the honey is sealed it is safe, while others disagree. Can you give me any definite information?

The Horticulture Division :—

What is presumed to be the most common plant from which poisonous honey is gathered is *Brachyglottis repanda*—commonly called (but wrongly so) "rangiora." This plant should be called "wharangi-tawhito"; it is common in the northern districts. *Brachyglottis rangiora* is common in the northern portion of the North Island; it is also found in the South Island, and is correctly and commonly called "rangiora." They are of the same family, but rangiora is certainly the more handsome plant. *Ranunculus rivularis*, commonly called "waoriki," is a swamp-buttercup with a yellow flower, and this plant also yields a poisonous nectar in the flowering season. It is gratifying to know, however, that all the poisoning cases which have been investigated have been due to eating the honey in the spring before it has been ripened by the bees, and no cases have been known when only ripe or capped honey has been used. This would naturally suggest that the poison is volatile, and is evaporated by the bees before the cappings of wax are placed in position to seal the cells. So far as the honey produced by commercial beekeepers in the districts affected is concerned, there is no danger whatever, as the produce is not extracted from the combs until the cells are sealed, and private owners need not be afraid as long as they take the same precautions.

THE HORSE BOT-FLY.

A. F. COOK, Waipukurau :—

I shall be glad if you will advise me as follows: (1.) Will the larvæ of the bot-fly adhere to the stomach of a horse and eat away the mucous membrane, finally killing the horse? (2.) If so, can the larvæ be killed in the horse, and at what stage or month of the year? (3.) Is there any method of preventing the fly attacking the horse?

The Live-stock Division :—

Bots are the larval form of the bot-fly (*Oestrus equi*). The eggs are laid on the hairs of the front part of the body. They are licked off by the animal and taken into the stomach, where they develop into the bot. They are passed through the bowels during the early summer, when they complete their development into the adult fly. We do not think that by themselves the bots will actually cause death, but they may be a contributing cause with other complications. We have made *post-mortem* examinations on horses which have died from quite another cause, and found the stomach-lining covered with the larvæ. Many lines of treatment have been adopted for driving them out, but without success. Preventive

measures are simple, and are to be recommended. The eggs should be destroyed before being taken in by the horse. This is best done by singeing—either with a candle or wax taper—the hairs on which the eggs are placed. The parts where the fly strikes may also be smeared with a preparation the odour of which it dislikes. We have found the following preparation useful for the purpose: Creosote, 2 drams; oil of eucalyptus and turpentine, $\frac{1}{2}$ oz. each; salad-oil, 1 pint.

CRACKED HOOFS IN COW.

T. E. T., Tinwald :—

Could you inform me as to the best treatment for cracked hoofs in a cow. The cracks resemble the backbone of a fish, and run from the hair almost to the end of the hoof, one clove of both front hoofs being affected. Moisture exudes from the cracks when pressed.

The Live-stock Division :—

The treatment recommended is to soak the hoofs in an antiseptic solution—two tablespoonfuls of Jeyes Fluid or similar preparation to a gallon of warm water—until thoroughly cleansed. The cow should then be allowed to stand on clean, dry straw until the hoofs are perfectly dry. The cracks should then be filled up with Stockholm tar and the animal turned on to a dry pasture.

BLADDER OR POCKET PLUMS.

“SETTLER,” Matamata :—

Will you kindly tell me what is the cause of pods or bladders forming on Japanese-plum trees, and what treatment would be the best for same? The enclosed specimens were picked from a tree bearing several hundred similar pods but very few plums.

The Horticulture Division :—

The formation of “bladder” or “pocket” plums is caused by a disease known as *Exoascus pruni*. Though all the plums are liable to be affected, Japanese varieties are those most frequently attacked. The disease is most prevalent when the spring is abnormally wet. In cases, however, where the disease has previously appeared and not been checked, a tree may be badly affected even though the spring weather be not abnormally wet. Perfect control by spraying alone must not be expected, nevertheless it has been proved that spraying must accompany other measures. Spray with 8-6-40 bordeaux mixture just before growth begins in spring; with 4-4-40 when the cluster-buds open but before the blossoms open, and again when nearly all the petals have fallen. In cases where the earlier spraying has been neglected the only thing possible in this way is to spray with 4-4-40 bordeaux. At the same time thoroughly spray the surface soil also with the same mixture. All deformed plums should be gathered and burned or buried very deeply in the ground. Twigs that are badly affected should be cut off and burned. In aggravated cases it is sometimes best to head a tree down, and between the two extremes there may be intermediate treatment, such as the removal of branches, as may be thought necessary.

MANGOLDS AND PUMPKINS FOR PIGS.

W. G. S., Awapuni :—

Could you tell me if mangolds fed to breeding-sows would cause them to slip, as I have been told they do? Can pumpkins be given to pigs as feed?

The Live-stock Division :—

Brood-sows take no harm from mangold feeding, and are not likely to slip from this cause. Mangolds should not be fed, however, until after they have been stored for some time in a clamp or barn. Pumpkins are a valuable winter food for pigs, and should be grown in far greater quantities than is the case at present. Pumpkins are relished by pigs, and they help to bring the animals through the winter in good condition.

MAFFRA BEET-SUGAR FACTORY.

OPERATIONS AND RESULTS FOR 1919-20.

THE account of the operations of the Maffra factory published in the last two issues of the *Journal* brought the record up to the 1918-19 season. Particulars for 1919-20 are now kindly supplied by the Victorian Department of Agriculture as follows:—

1,080 acres were harvested for 13,084 tons of beet, producing 1,551 tons of white sugar. The price of beets was £1 15s. per ton. The yield was satisfactory (percentage of sugar in cossettes, 15.0; percentage of purity, 84.4), and, though expenses increased, a quick run and an advance in the price of sugar enabled the factory to show the substantial profit of £16,749 13s. 1d. The general expenditure was £50,416, and interest and depreciation £5,627.

The balance-sheet for the year is as follows: Liabilities at 30th June, 1920, £103,124 13s. 11d.; profit and loss account (profit for year after interest and depreciation, £16,749 13s. 1d., less balance of loss brought forward, £11,758 16s. 7d.), £4,990 16s. 6d.: total, £108,115 10s. 5d. Assets—Land, plant, equipment, &c., £50,851 18s. 4d.; debtors, &c., £7,801 12s. 1d.; stocks, £49,462: total, £108,115 10s. 5d.

These results, based on so small an acreage, states the Department, must be considered directly satisfactory; and indirectly, the employment of about 250 men, and the value of the by-products for dairying and stock-feeding, make the industry of particular value throughout the district. The demand for sugar is exceptionally keen.

IMPORTATION OF FERTILIZERS: SEPTEMBER QUARTER.

FOLLOWING are the importations of fertilizers into New Zealand for the quarter ended 30th September last, the name, quantity, and value of each kind, together with country of departure, being specified:—

Sulphate of Ammonia.—United Kingdom, 212 tons, £7,296; Australia, 160 tons, £6,049: total, 372 tons, £13,345.

Blood Manure.—Australia, 14 tons, £300.

Gypsum.—United Kingdom, 3 tons, £44.

Nitrate of Soda.—Australia, 111 tons, £2,780.

Basic Slag.—United Kingdom, 2,304 tons, £22,066; Belgium, 3,274 tons, £32,933; France, 75 tons, £687; Luxemburg, 510 tons, £4,264; Netherlands, 250 tons, £2,918: total, 6,413 tons, £62,868.

Blood-and-bone.—Australia, 57 tons, £940.

Bonedust.—Australia, 1,356 tons, £19,648.

Char Dust and Bone Char.—Australia, 459 tons, £3,299.

Guano.—United Kingdom, 35 tons, £745; New Caledonia, 4,026 tons, £6,180: total, 4,061 tons, £6,925.

Rock Phosphate.—Australia, 4,048 tons, £17,655; Makatea Island, 13,998 tons, £34,697: total, 18,046 tons, £52,352.

Superphosphate.—Australia, 6,452 tons, £49,937; Japan, 9,067 tons, £48,835: total, 15,519 tons, £98,772.

Other Phosphates.—United Kingdom, 1 ton, £14; France, 100 tons, £751: total, 101 tons, £765.

Kainit.—United Kingdom, 2 tons, £54.

Muriate of Potash.—France, 50 tons, £1,273.

Sulphate of Potash.—France, 74 tons, £2,048; Germany, 131 tons, £3,753; Netherlands, 16 tons, £438: total, 221 tons, £6,239.

Other Potash.—France, 100 tons, £712.

Sulphate of Iron.—Australia, 35 tons, £370.

Other Fertilizers.—United Kingdom, £10.

NOTE.—With regard to the "declared values" which are given above, the Comptroller of Customs makes the following explanation: "The value for duty is the fair market value in the country whence the goods are imported, plus 10 per cent. As the addition of 10 per cent. does not nearly cover the present freight, insurance, and other charges, the statistical value is a long way less than the actual landed value."

THE HORSE-BREEDING ACT OF VICTORIA.

THE Horse-breeding Act, 1919, of Victoria, and the regulations thereunder gazetted on 9th April and 21st July, 1920, respectively, which are now in force, bring into operation the compulsory registration of all stallions used for stud purposes within that State. The uncertificated horse is thus put right out of breeding operations, and may not even be used with the mares of his owner. A fine of up to £100 may be inflicted on any person using an unregistered stallion for stud purposes, the penalty applying equally to the owner of the mare served and to the owner of the stallion. "Owner," as defined by the Act, means any owner, whether jointly or in severalty, and whether absolutely or as lessee, or person in possession or charge of a stallion. Severe penalties are also provided to meet other contraventions of the Act. Thoroughbred stallions registered in the Australian Stud-book or in the register kept by the Victorian Trotting and Racing Association do not, however, come within the scope of the Act while being used solely in regard to thoroughbred mares also registered in either of these stud-books.

The Act provides for the keeping of a Register of Stallions by the Chief Veterinary Inspector of the Department of Agriculture, to whom application must be made and a fee of £1 forwarded on or before 1st July in each year in respect of each stallion requiring registration. The stallion must then be submitted for examination by a veterinary officer of the Department of Agriculture at the most convenient inspection parade of the series held in the various centres for this purpose. Failing this, the owner must make application for a special parade, for which an extra fee is chargeable. If, as a result of this examination, the animal is found to be of reasonable standard as regards type, conformation, and breeding, and is free from the following forms of hereditary unsoundness—namely, bog-spavin, bone-spavin, cataract, chorea ("shivering" or "nervy"), curb, navicular disease, nasal disease (osteoporosis), ringbone, roaring, sidebone, stringhalt, thoroughpin, whistling—its name will be entered on the register and a certificate issued. In the case of registration being refused the owner may apply for re-examination of his stallion by an appeal board consisting of the Chief Veterinary Inspector and two members of a panel of referees constituted for that purpose.

Should circumstances warrant, a special examination of any registered stallion may be made at any time, and as a result of such examination registration may be cancelled. Any stallion of which registration has been refused or cancelled may not be again presented for examination except to the appeal board, whose decision will be final. Exemptions from annual examination are made in the case of stallions of five or more years of age which have been registered under the Act, or in respect of which a "life" certificate of soundness has been issued by the Department of Agriculture before the commencement of the Act.

Each certificate of registration issued under the Act remains in force for one year, and must be returned to the Chief Veterinary Inspector when making application for reregistration at the end of that time. Notice must also be given and the certificate returned in the event of the sale or letting of the stallion, or of its castration or death. In the former case the register entry will be altered and the certificate endorsed to the new owner. Steps must be taken to have this effected immediately the sale takes place, as the seller's certificate, unless endorsed, holds good only for one month thereafter. The certificate or a certified copy (which may be obtained on paying an additional fee of £1) must be produced on the demand of either the owner of a mare to be served, an officer of the Department of Agriculture, or a police officer.

ESTIMATED AREAS UNDER WHEAT AND OATS.

THE Government Statistician has issued estimates of the areas under wheat and oats in the Dominion for the current season, based on the usual card census, as follows: Wheat—South Island, 208,300 acres; North Island, 5,600 acres: total, 213,900 acres. Oats—South Island, 408,200 acres; North Island, 60,500 acres: total, 468,700 acres. In the previous (1919-20) season the corresponding totals were approximately 142,000 acres of wheat and 576,000 acres of oats. As regards wheat varieties sown this current season, growers have furnished the following acreages: Tuscan or long-berry, 116,009; Hunters (various), 57,425; Velvet or Pearl, 19,230. The balance of the total area is unspecified.

REGULATIONS FOR THE INTRODUCTION OF BEES, HONEY, AND APPLIANCES INTO NEW ZEALAND.

THE conditions under which bees, honey, and appliances (the latter comprising any hive, frame, comb-foundation, or other thing used in connection with the keeping of bees and the harvesting of their products) may be introduced into New Zealand are defined in regulations under the Apiaries Amendment Act, 1913, which were gazetted on 7th October last and came into force on that date.

The introduction of bees and honey is absolutely prohibited except as specified. Auckland, Wellington, Lyttelton, Dunedin, and Bluff are appointed the only ports of entry for bees and honey; consignments for other New Zealand ports must therefore obtain a permit to land from the Inspector of the Department of Agriculture at one of these ports before being finally landed at their destination. Bees may also be introduced through the parcel-post, in which case they will be held for examination at the chief post-office for the district in which their port of entry is situated.

Bees may be imported from any province or State of Italy, the United States of America, or of the Commonwealth of Australia, but must in each case be accompanied by a certificate signed by the shipper setting forth all particulars as to the origin and packing of the consignment, and certifying that the bees and containers are clean and free from disease, and that foul-brood is not known to exist within five miles of the apiary from which they were obtained. This declaration must be certified as correct by a responsible officer of the Department of Agriculture of the country or State in which the bees were bred.

Honey may be introduced into New Zealand from any State of the United States of America or the Commonwealth of Australia, provided that each consignment is accompanied by the shipper's declaration as to its freedom from disease, the State in which it was produced, &c., such certificate to be officially certified as in the case of bees.

In the case of both bees and honey the official certificate must certify that the disease *Nosema apis* (known as Isle of Wight disease) is not known to exist in the country or State in question.

With the exception of containers necessary for the introduction of bees into New Zealand, no appliances which have been used in connection with bees may be imported.

On the arrival of bees or honey at a port of entry they will be examined by the Inspector, who, if satisfied that they are free from disease, that the accompanying certificates are in order, and that the law has been fully complied with, will issue a permit for their landing. Power is given the Inspector to seize any bees, honey, or appliances introduced or attempted to be introduced without compliance with these regulations, and to either destroy the same or to reship them to some port outside New Zealand at his discretion. Any expense incurred in this connection must be borne by the owner of the bees or honey.

Any person committing a breach of the regulations is liable to a penalty of £5.

RURAL EDUCATION.

At a meeting of the Board of Agriculture, early this month, Dr. Reakes, Director-General of Agriculture, reported that the recommendations with regard to rural education which the Board had made to the Council of Agriculture had been subsequently brought forward and discussed at a conference held recently in Wellington between the Agriculture and Education Departments, and that this gathering had endorsed most of the suggestions that had been made by the Board.

Steps had been taken to define the sphere of action of the officers of both Departments. It had been decided that the Instructors of the Education Boards should deal with rural education in the primary, secondary, and technical schools, while the officers of the Department of Agriculture should undertake the practical farm training of the farmers and of the lads who had left school. Pending the securing of a sufficient number of instructors to meet requirements the field officers and instructors of the two Departments would work in co-operation. Steps were also taken to provide for the training of more instructors in the various branches of agriculture, both for the Department of Agriculture and for the Educa-

tion Department. It was urged that facilities for teaching the subjects required for the B.A. pass in agricultural science and for advanced agricultural science for the B.Sc. degree should be provided at each of the University colleges; and, further, that increased encouragement should be given at the training colleges to students who show a special aptitude for agricultural work to proceed to an agricultural college to complete their training. It had also been agreed between the two Departments that a bureau of information and guidance should be established to induce lads from secondary and technical schools, as well as teachers and other persons, to pursue a course of study in agriculture and to advise them concerning the steps they should take.

Agricultural Clubs for Boys and Girls.—The conference of the two Departments had also endorsed the recommendation of the Board of Agriculture that steps should be taken to initiate agricultural clubs for boys and girls in various parts of New Zealand, on similar lines to those which had been found of such great service in Canada and the United States of America in awakening an interest in improved methods of raising crops and live-stock. Dr. Reakes stated that he would be glad to have the views of the Board as to the best methods to bring the agricultural and pastoral associations and other farmers' organizations into this movement. After some discussion, the Board recommended that an organizer should be appointed to visit the different districts and the agricultural and pastoral associations, &c., that wished to start clubs of this description in their centres; also that a sum of money should be set aside for the purpose; further, that the agricultural and pastoral associations be invited to co-operate in the movement by opening special classes, and offering prizes for the best animals or produce exhibited by members of such clubs.

THE SEASON'S LAMBING: NORTH ISLAND ESTIMATE.

THE estimated average lambing in the North Island for the current season (computed from estimates furnished by the Inspectors of Stock in the various districts) is 87.95 per cent. On the basis of 5,838,704 breeding-ewes in the North Island, as shown in the last sheep returns, the estimated number of lambs works out at 5,135,524. The estimated percentage in 1919 was 81.57, and the number of breeding-ewes 6,311,797. South Island and Dominion estimates for the current season will be published in next month's issue.

Introduction of Live-stock into Fiji.—The Fiji Government regulations governing this matter, which were gazetted here for general information on 8th April last, have been amended in various respects. The amendments are published in the *New Zealand Gazette* of 16th September, 1920.

Packing of Cheese.—The following regulations under the Dairy Industry Act were gazetted on 21st October and came into force on the same date: (1.) Every owner of a registered dairy manufacturing cheese shall keep his cheese on shelves for at least fourteen days before packing them. (2.) He shall also, before sending any cheese to an appointed grading-store, plainly mark on every package of such cheese the vat-number and the day and month of the manufacture of such cheese.

Alsation Potash Fertilizers.—The following is from the *Chemical Age*, of July last: "The demand for Alsation potash salts continues good. The following quantities have been shipped to the United Kingdom during the past week: 14-per-cent. sylvinite (French kainit), 4,041 tons; 20-per-cent. sylvinite (French manure salts), 2,648 tons; 50-per-cent. muriate of potash, 240 tons. The following prices are quoted: Sylvinite, 14-16 per cent., £7 15s. per ton, f.o.r.; sylvinite, 20 per cent., £9 15s. per ton, f.o.r.; sylvinite, 30 per cent., £14 per ton, f.o.r.; muriate of potash, 50 per cent., £28 7s. 6d. per ton, f.o.r."